

NEOSHO RIVER BASIN TOTAL MAXIMUM DAILY LOAD

Water Body: Gridley City Lake
Water Quality Impairment: Beryllium

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasin: Upper Neosho

County: Coffey

HUC 8: 11070204

HUC 11 (HUC 14): **010** (050)

Ecoregion: Central Irregular Plains/Osage Cuestas (40b)

Drainage Area: Approximately 1.1 square miles.

Conservation Pool: Area = 32.5 acres
Maximum Depth = 3.0 meters (9.8 feet)
Mean Depth = 1.3 meters (4.3 feet)
Retention Time = 0.09 years (1 month)

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

Authority: City of Gridley

2002 303(d) Listing: Neosho Basin Lakes

Impaired Use: Food Procurement

Water Quality Standard: Food Procurement: 0.13 Fg/L K.A.R.28-16-28e (d) (1a)

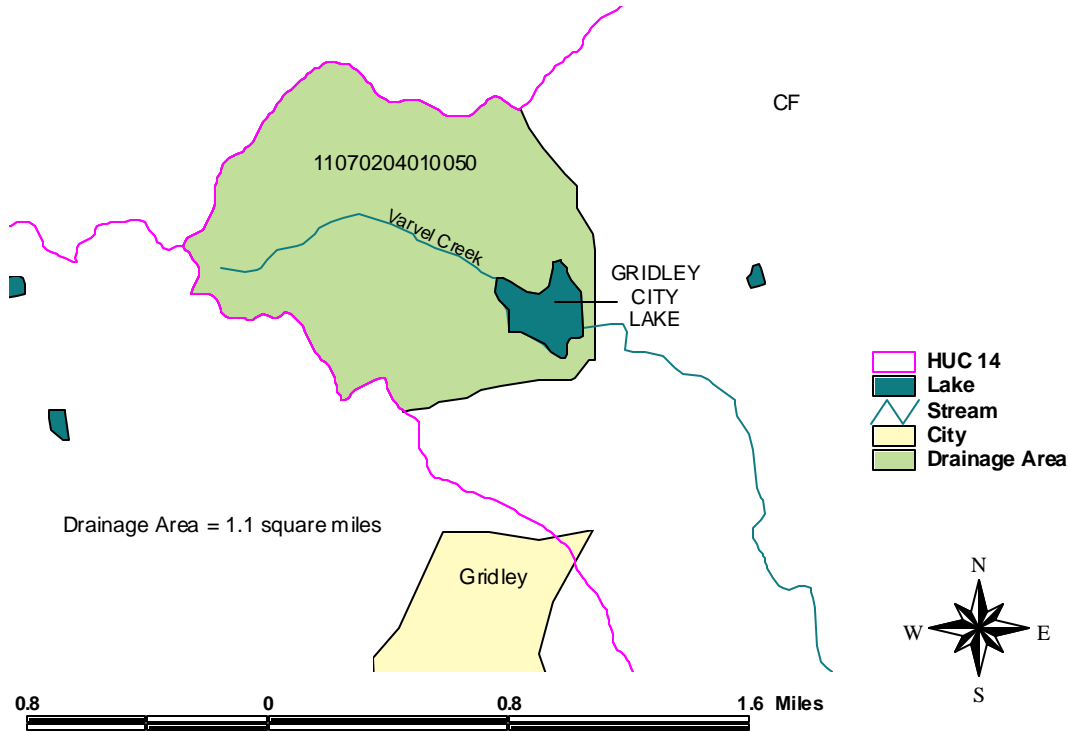
2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

Monitoring Sites: Station 045601 in Gridley City Lake (Figure 1).

Period of Record Used: Water Quality Data - Three surveys during 1991 - 2001
Air Monitoring Data - Nine surveys during 1990 - 1998

Figure 1

Gridley City Lake TMDL Reference Map



Current Condition: One beryllium sample, with a concentration of 0.002 mg/L, exceeded the water quality standard over the period of record. The remaining samples were below the detection limit of 0.001 mg/L. The elevated concentration occurred in 1997. It is likely that the elevated beryllium level was due to analytical error or sample contamination, since the three other samples taken on the same day were below the detection limit. If the sample included suspended sediment, beryllium could have dissolved from the sediment during acid digestion. If these are not the cause of the impairment, then atmospheric deposition of beryllium or geology may be the contributing factors.

Interim Endpoints of Water Quality (Implied Load Capacity) at Gridley City Lake over 2007 - 2011:

The desired endpoint will be to maintain beryllium concentrations at or below 0.13 Fg/L. Refined endpoints will be developed in 2007 to reflect additional sampling and artificial source assessment and confirmation of impaired status of lake.

3. SOURCE INVENTORY AND ASSESSMENT

Atmospheric Deposition: In 1997 and 1998, beryllium was detected in air monitoring samples around the state. The highest levels of beryllium in total solid particulate samples were seen in Topeka. This monitoring location was between two medical waste incinerators. Since 2001, the two hospitals have stopped incinerating.

Total Solid Particulate Samples (100 micrometer) over the Detection Limit (1990 to 1998)

Location	Year	Beryllium (Total Solid Particulate) ng/cubic meter		
		Mean	1st Maximum Sample	2nd Maximum Sample
Wichita, G. Washington Blvd & E. Skinne	1997	0.046	1.000	< 0.03
Wichita, Fire Station #12 Glen & Pawnee	1997	0.063	2.000	< 0.03
Tribune, KSU Experiment Station	1997	0.065	2.000	< 0.03
Kansas City, 619, Ann Ave.	1997	0.068	2.000	< 0.03
Elkhart, Cimarron National Grassland Area	1997	0.069	2.000	< 0.03
Chanute, 1500 W. 7th	1998	0.100	2.000	2.000
Topeka, 1615 W. 8th	1997	0.229	5.000	4.000

Particulate Matter (10 micrometers or less) Samples over the Detection Limit (1990 to 1998)

Location	Year	Beryllium (PM10) ug/cubic meter		
		Mean	1st Maximum Sample	2nd Maximum Sample
Topeka, 1500 N. Quincy	1997	0.0003	0.0010	< 0.0003
Kansas City, 444 Kindelberger	1997	0.0003	0.0020	< 0.0003
Larned, Moffett Stadium	1997	0.0003	0.0020	< 0.0003
Deerfield, 622 N. Main (City Hall)	1997	0.0004	0.0050	0.0010
Dodge City, Pump Station 2100 1st Ave	1997	0.0034	0.0020	< 0.0003
Dodge City, Pump Station 2100 1st Ave	1998	0.0039	0.0030	0.0020

Beryllium in Mineral Rocks, Soil, and Dust: The geology is a possible source of the beryllium. The Pennsylvania System, that underlies Gridley City Lake, contains concentrations of beryllium that can reach up to 3 ppm (mg/kg). This level is within the average range for rocks. The pH would need to be below 5 in order to make a significant difference to the beryllium concentration in the lake. The pH in Gridley City Lake averaged 7.5 in 2001. Windblown dust is another mode of entry.

It is unlikely that significant amounts of beryllium are being carried in during high flow events. If that was the case, beryllium concentrations should be higher when turbidity and total suspended solids are increased. For Gridley City Lake, an inversely proportional relationship between beryllium concentration and sediment load is seen.

Samples Taken by the KDHE Lake Monitoring Program

Date	Secchi Disc Depth (m)	Beryllium (mg/L)	Total Suspended Solids (mg/L)	Turbidity (formazin turbidity units)
8/19/1991	0.6	< 0.001	17.0	7.8
8/19/1991		< 0.001	13.0	9.0
8/19/1991		< 0.001	17.0	11.2
8/19/1991		< 0.001	19.0	11.0
6/9/1997	1.9	< 0.001	4.0	1.9
6/9/1997		0.002	4.0	1.5
6/9/1997		< 0.001	5.0	1.6
6/9/1997		< 0.001	4.0	1.6
7/10/2001	0.6	< 0.001	14.0	9.7
7/10/2001		< 0.001	13.0	9.8
7/10/2001		0.001	25.0	15.0
7/10/2001		< 0.001	21.0	15.0

Other Sources of Beryllium: Anthropogenic emissions of beryllium include industry, metal mining, electric utilities, and waste and solvent recovery. Of these, electric utilities account for the majority of the emissions. Coal is the primary energy source in Kansas.

Beryllium metal is used in the aerospace and defense industry (i.e., rocket fuels, heat shields, and nuclear weapons), ceramic manufacturing, fiber optics, and as an electrical insulator. Because the fumes and dust are toxic to humans, work with the compound is minimized. It is unlikely that particulates from this source would cause an impairment.

4. ALLOCATION OF POLLUTANT REDUCTION RESPONSIBILITY

Point Sources: A current Wasteload Allocation of zero is established by this TMDL because of the lack of point sources in the watershed. 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 beryllium impairment is most likely due to atmospheric deposition and geology. The Load Allocation will be set at concentrations of beryllium not to exceed 0.12 F g/L in Gridley City Lake.

Defined Margin of Safety: The margin of safety provides some hedge against the uncertainty of the beryllium endpoint. Therefore, the margin of safety will be 0.01 F g/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 beryllium exceedence only occurred once, this TMDL will be a Low Priority for implementation.

Unified Watershed Assessment Priority Ranking: This watershed lies within the Upper Neosho (HUC 8: 11070205) with a priority ranking of 20 (High Priority for restoration).

Priority HUC 11s: The beryllium concentration exceeded the water quality standard once over the period of record. If more elevated samples are detected, then natural and anthropogenic air emissions may need to be addressed.

5. IMPLEMENTATION

Desired Implementation Activities

The exceedence was a one time occurrence. If beryllium continues to be an impairment, then reducing air emission might improve water quality in Gridley City Lake.

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 Health and Environment. 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 Gridley City Lake will be reexamined to confirm the impaired status of the lake. 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.

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: The water quality impairment may be corrected by reducing the amount of beryllium in air emissions.

6. MONITORING

Further sampling and evaluation of Gridley City Lake 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.

Milestone Evaluation: In 2007, evaluation will be made as to the current condition of Gridley City Lake. Subsequent decisions will be made regarding the implementation approach and follow up of additional implementation in the state.

Consideration for 303(d) Delisting: The lake 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

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