

SMOKY HILL/SALINE RIVER BASIN TOTAL MAXIMUM DAILY LOAD

Water Body: Herington Reservoir Water Quality Impairment: Atrazine

Subbasin: Lower Smoky Hill

Counties: Dickinson and Marion

HUC 8: 10260008 **HUC 11 (14): 070 (010)**

Ecoregion: Flint Hills (28)

Drainage Area: Approximately 24.4 square miles

Conservation Pool: Area = 500 acres
Watershed Area: Lake Surface Area = 31:1
Maximum Depth = 9.0 meters (30 feet)
Mean Depth = 3.2 meters (10 feet)
Retention Time = 1.0 year (12 months)

Designated Uses: Secondary Contact Recreation; Special Aquatic Life Support; Drinking Water; Food Procurement; Industrial Water Supply

Authority: City of Herington

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

Impaired Use: Special Aquatic Life Support and Drinking Water are impaired from Atrazine

Water Quality Standard: Atrazine: 3 $\mu\text{g/l}$ (ppb) (KAR 28-16-28e(c)(2)(F)(ii) and (3)(A))

2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

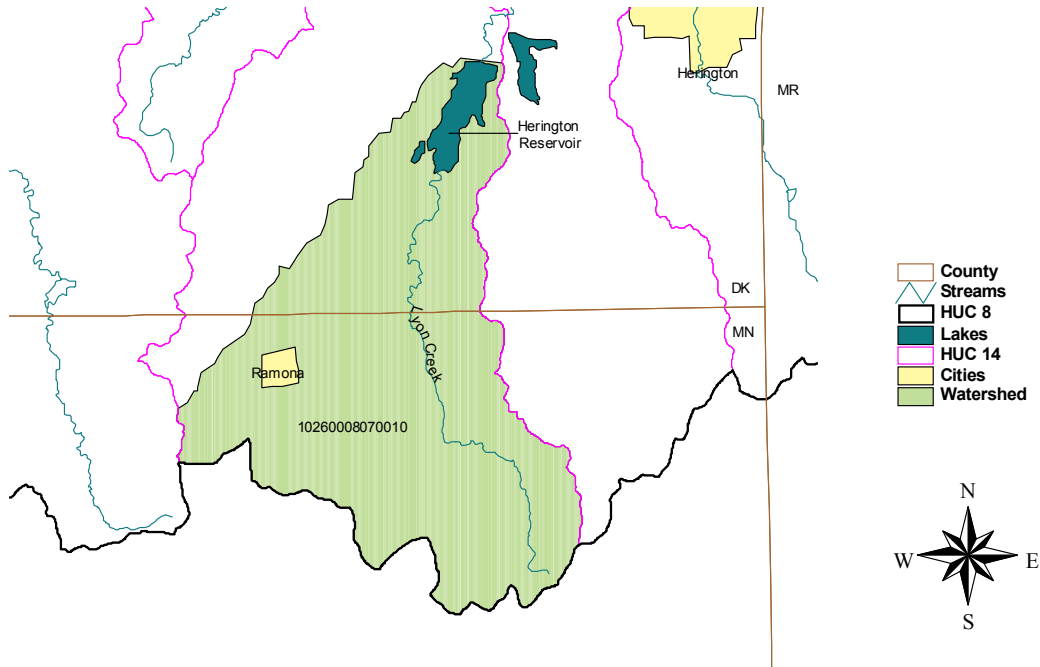
Level of Support for Designated Use under 303(d): Not Supporting Aquatic Life and Domestic Water Supply Uses.

Monitoring Sites: Station 047201 in Herington Reservoir (Figure 1).

Period of Record Used: Fifteen surveys during 1987 - 2000

Figure 1

Herington Reservoir TMDL Reference Map



Current Condition: Atrazine, a herbicide, is applied to agricultural fields in early spring, prior to planting, and occasionally in the fall. With heavy rainfalls in spring, Atrazine is transported on sediment and in a dissolved phase into streams and lakes. Over the period of record, the Atrazine concentrations have risen above the Water Quality Standard three times (20% exceedence). The average concentration for this time period is 2.7 $\mu\text{g/L}$ of Atrazine, ranging from 1.6 $\mu\text{g/L}$ to 6.4 $\mu\text{g/L}$.

The Atrazine impairment was carried over from the 1998 303(d) List to the 2002 303(d) List. Based on the last five years worth of data (1996 to 2001), the average Atrazine concentration is 4.7 $\mu\text{g/L}$. Given this concentration, there is approximately 67.1 pounds of Atrazine in Herington Reservoir.

Atrazine Levels in Herington Reservoir

Date	Atrazine ($\mu\text{g/L}$)
6/29/87	4.5
7/24/89	2.8
10/1/90	1.8
4/1/91	2.0

5/6/91	1.7
6/3/91	2.5
7/8/91	2.6
8/5/91	2.2
9/3/91	2.3
10/7/91	1.8
6/20/94	3.4
8/22/94	1.6
8/21/95	1.6
7/2/96	6.4
7/10/00	2.9

Interim Endpoints of Water Quality (Implied Load Capacity) at Herington Reservoir over 2008 - 2012:

The desired endpoint will be Atrazine concentrations at or below 3 µg/L by 2012. Seasonal variation in endpoints will not be defined by this TMDL since the reservoir integrates the spring runoff season with the high use summer season by its flow detention characteristics. The desired endpoint will apply to samples taken between April and October over 2008-2012.

This endpoint will be reached as a result of expected 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 endpoints indicates loads are within the loading capacity of the lake, water quality standards are attained with minimal excursions and full support of the designated uses of the lake has been restored.

Current Condition and Reductions for Herington Reservoir

Parameter	Current Condition	TMDL	Percent Reduction
Atrazine (µg/L)	4.7	< 3	36 %

3. SOURCE INVENTORY AND ASSESSMENT

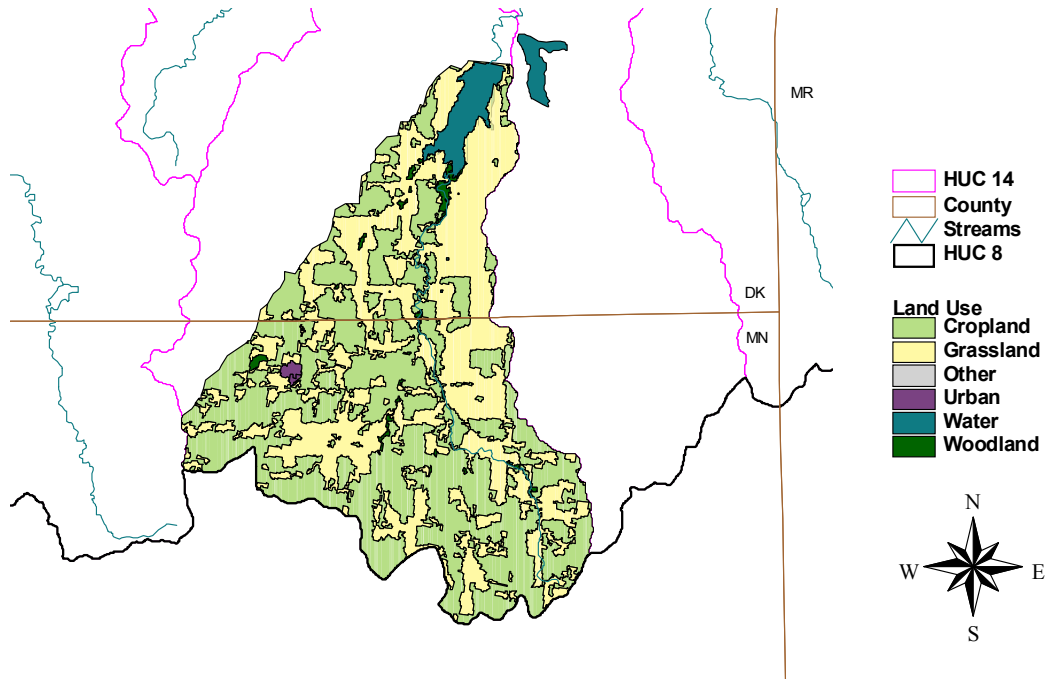
Land Use: The watershed around Herington Reservoir has a moderate potential for nonpoint source pollutants. The main source of Atrazine within Herington Reservoir is probably runoff from agricultural lands where the herbicide has been applied. Land use coverage analysis indicates that 51.7 % of the watershed is cropland (Figure 2).

2001 Published Estimates

	Acres of Corn for Grain	Acres of Sorghum for Grain	Acres of Soybeans
Dickinson County	7,500	60,600	38,800
Marion County	11,400	67,500	34,300

Figure 2

Herington Reservoir Land Use



Contributing Runoff: The watershed's average soil permeability is 0.5 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 14.2% of this watershed, chiefly along the stream channels.

4. ALLOCATION OF POLLUTANT REDUCTION RESPONSIBILITY

Point Sources: Since there are no point sources located in the lake watershed and this impairment is primarily associated with agricultural nonpoint source pollution, the Wasteload Allocation assigned to point sources under this TMDL is zero.

Non-Point Sources: As described in the Source Assessment, the drainage has a high proportion of cropland and a strong propensity for runoff. The Load Allocation is estimated loadings of Atrazine reduced by 36% annually in order to achieve full support of the lake uses, leaving 38.5

pounds of Atrazine within the lake.

Defined Margin of Safety: The margin of safety will be 4.3 pounds of Atrazine (ten percent of the Atrazine load capacity), allowing 42.8 pounds to be retained by the lake.

State Water Plan Implementation Priority: Because Herington Reservoir is used for drinking water and a substantial amount of sampling has been done, this TMDL will be a Medium Priority for implementation.

Unified Watershed Assessment Priority Ranking: Herington Reservoir lies within the Lower Smoky Hill (HUC 8: 10260008) with a priority ranking of 35 (Medium Priority for restoration).

Priority HUC 11s: Since it encompasses the entire Herington Reservoir watershed, the HUC 11 (10260008070) should take priority.

5. IMPLEMENTATION

Desired Implementation Activities

1. Implement proper mix of pesticide use best management practices, including incorporation, application timing, banding, alternative weed control and buffer zones
2. Implement necessary storage and handling site best management practices
3. Install necessary grass buffer strips along streams.
4. Increase label compliance by applicators
5. Harmonize water quality protection measures and use directions on labels of products containing Atrazine

Implementation Programs Guidance

Non-Point Source Pollution Technical Assistance - KDHE

- a. Support Section 319 demonstration projects for reduction of Atrazine runoff from grain sorghum and soybean cropland.
- b. Provide technical assistance on practices geared to establishment of vegetative buffer strips.
- c. Guide federal programs such as the Environmental Quality Improvement Program, which are dedicated to priority subbasins through the Unified Watershed Assessment, to priority subwatersheds and stream segments within those subbasins identified by this TMDL.
- e. Develop a Watershed Restoration and Protection Strategy for HUC 10260008.

Water Resource Cost Share & Non-Point Source Pollution Control Programs - SCC

- a. Provide pesticide management areas for storage, mixing and handling.
- b. Provide pesticide management practices to minimize pesticide spillage

Riparian Protection Program - SCC

- a. Establish or reestablish natural riparian systems, including vegetative filter strips and streambank vegetation.
- b. Develop riparian restoration projects in cropland areas

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 grain sorghum and soybean producers on pesticide management
- b. Provide technical assistance on buffer strip design and minimizing cropland runoff and construction of pesticide handling pads

Pesticide Management Program - KDA

- a. Implement pesticide bulk containment regulations
- b. Increase label compliance by pesticide applicators
- c. Harmonize product labels regarding use and protection measures
- d. Continue basin pesticide education efforts through Kansas State and commodity associations

Time Frame for Implementation: Water quality improvement activities are encouraged at the local level prior to 2008. Pollution reduction practices should be installed within the lake drainage after the year 2008. Evaluation of Atrazine sources to lake and identification of potential management techniques should occur prior to 2008.

Targeted Participants: Primary participants for implementation will be agricultural producers operating within the watershed. Implemented activities should be targeted at those areas with greatest potential to impact the lake. Nominally, this would be activities located within one mile of the streams including:

1. Total corn, soybean, and sorghum acreage
2. Location of tile drain outlets draining into streams.
3. Location of pesticide storage, mixing and handling sites
4. Cultivated riparian areas
5. Number of pesticide applicators
6. Use of pesticide products containing Atrazine

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 2008: The year 2008 marks the midpoint of the ten-year implementation window for the watershed. At that point in time, sampled data from Herington Reservoir should indicate probable sources of Atrazine and plans in place to initiate implementation.

Delivery Agents: The primary delivery agents for program participation will be 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 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 Medium Priority consideration.

Effectiveness: Pesticide management has proven to be effective in reducing Atrazine levels in Perry Lake. Many voluntary approaches were promoted through the Pesticide Management Area established on the Delaware River Subbasin. Most of those producers raised corn. The key to effectiveness will be equivalent participation by other producers in the Herington Reservoir drainage area. The milestones established under this TMDL are intended to gauge the level of participation in those programs implementing this TMDL.

Should participation significantly lag below expectations over the next five years or monitoring indicates lack of progress in improving water quality conditions from those seen in 1996 and 2000, the state may employ more stringent conditions on agricultural producers in the watershed through extension of the Pesticide Management Area in order to meet the desired endpoints expressed in this TMDL.

6. MONITORING

Further sampling and evaluation should occur twice before 2008 and once between 2008 and 2012.

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 Herington Reservoir. Subsequent decisions will be made regarding the implementation approach and follow up of additional implementation in the watershed.

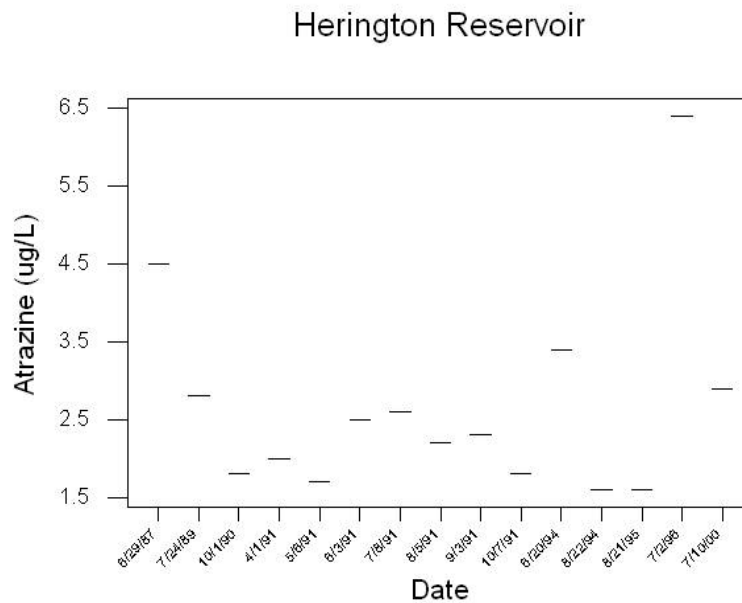
Consideration for 303(d) Delisting: The lake will be evaluated for delisting under Section 303(d), based on the monitoring data over the period 2008-2012. Therefore, the decision for delisting will come about in the preparation of the 2012 303(d) list. Should modifications be made to the applicable water 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].

Appendix A - Boxplots



Approved Sep. 30, 2003