KANSAS LOWER REPUBLICAN BASIN TOTAL MAXIMUM DAILY LOAD

Waterbody / Assessment Unit (AU): Grasshopper Creek Watershed
Water Quality Impairment: Atrazine

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasin: Delaware **Counties:** Atchison, Brown, and Jackson

HUC8: 10270103
HUC10 (HUC12): 02 (01, 02, 03)

Ecoregion: Western Corn Belt Plains, Loess and Glacial Drift Hills (47i)

Drainage Area: 94.3 Square Miles

Water Quality Limited Segments:

Main Stem	**Tributaries**	
Grasshopper Creek (18, 20)	Clear Cr (19)	Brush Cr (44)
	Mission Cr (40)	
	Otter Cr (41)	

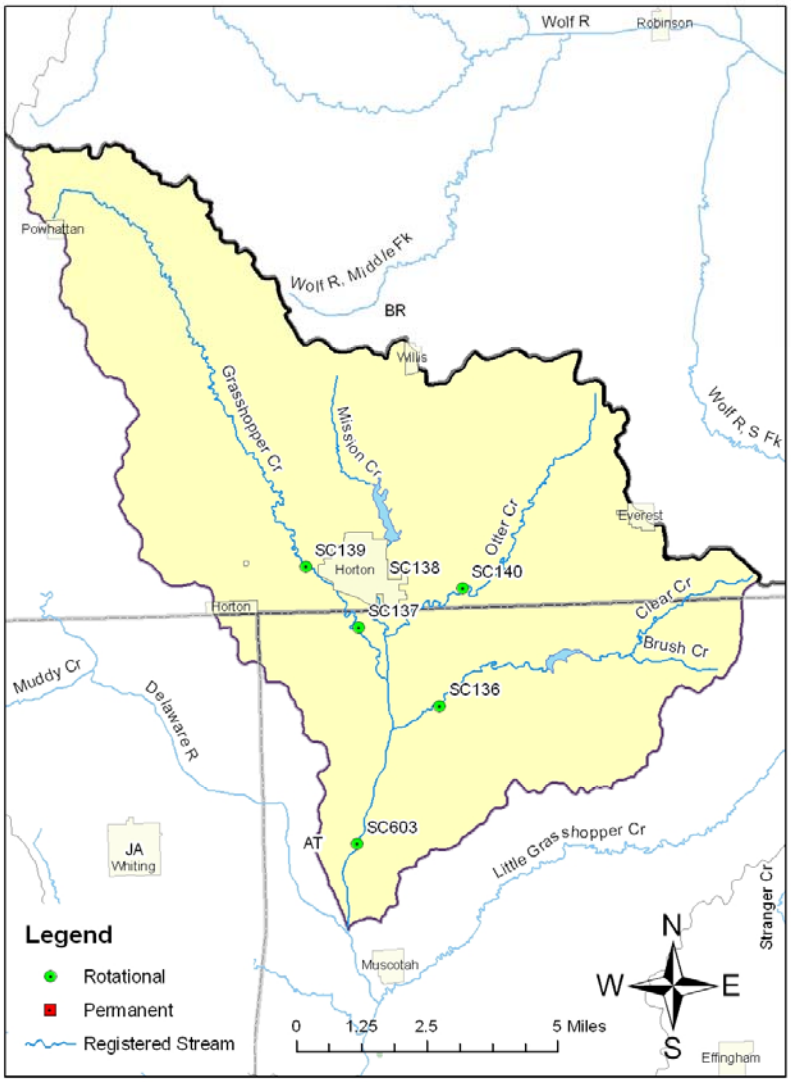
Designated Uses: Expected Aquatic Life, Primary Contact Recreation C, Drinking Water Supply, Food Procurement, Groundwater Recharge, Industrial Water Use, Irrigation Use, and Livestock Watering Use for Grasshopper Cr (18). Expected Aquatic Life, Secondary Contact Recreation b, Drinking Water Supply, Food Procurement, Groundwater Recharge, Industrial Water Use, Irrigation Use, and Livestock Watering Use for Grasshopper Cr (20). Expected Aquatic Life, Secondary Contract Recreation b, Food Procurement, Groundwater Recharge, Irrigation Use, and Livestock Watering Use for Otter Cr (41). Expected Aquatic Life, Primary Contact Recreation B, Drinking Water Supply, Food Procurement, Groundwater Recharge, Industrial Water Use, Irrigation Use, and Livestock Watering Use for Mission Creek (40) and Clear Creek(19). Expected Aquatic Life, Secondary Contact Recreation b, and Food Procurement for Brush Creek (44).

303(d) Listings: Station SC603, Grasshopper Creek, Atrazine; 2002, 2004, 2008 and 2010 Kansas Lower Republican River Basin Streams.

Impaired Use: Chronic Aquatic Life Support

Water Quality Criteria: Domestic Water Supply - Atrazine 3 µg/l (ppb) (Not Impaired) (annual average) (K.A.R. 28-16-28e(c)(3)(A))
Aquatic Life Support – Atrazine Chronic: 3 µg/l (ppb) (Impaired)
Aquatic Life Support – Atrazine Acute: 170 µg/l (ppb) (Not Impaired)
(K.A.R. 28-16-28e(c)(2)(D)(ii)) & (Table 1a; K.A.R. 28-16-28e(d))

Figure 1. Grasshopper Creek watershed.



2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

Level of Support for Designated Use under 2010 – 303(d): Not supporting Aquatic Life

Stream Monitoring Sites and Period of Record: Active KDHE Rotational ambient Stream Chemistry sampling station SC603, located on Grasshopper Creek 2 ½ miles North and ¼ mile West of Muscotah on K-9; sampled during the years of 1992, 1996, 1997, 1998, 2000, 2004, and 2008.

The following inactive KDHE Stream Chemistry sampling stations were sampled intensively from 1996-1998 as part of the Governor's Water Quality Initiative;

SC139 and SC137 on Grasshopper Creek
SC138 on Mission Creek
SC140 on Otter Creek
SC136 on Clear Creek
SC135 on Brush Creek

Flow Record: USGS Gage 06890092 (1992-1995) on Grasshopper Creek and USGS Gage 06890100 on the Delaware River near Muscotah (1990-2009) were utilized to establish flow conditions in the watershed. Two regression calculations utilizing the common period for the gages from 1992-1995 were developed and utilized to calculate flow values for Grasshopper Creek based on the actual recorded flow values on the Delaware River at USGS gage 06890100. Two regressions were calculated utilizing the common flow data for flows within the 0-24% flow exceedance range and the 25-100% flow exceedance range (see Appendix A).

Table 1. Long Term Flow conditions as calculated from USGS Flow data from USGS Gages 06890500 and 06890092 in cubic feet per second (cfs).

Stream	Avg.	Percent of Flow Exceedance				
		90%	75%	50%	25%	10%
Delaware River at Muscotah – Gage 06890100	238	3.4	13	40	117	364
Grasshopper Cr – Gage 06890092 (1992-1995)	116	3.8	6.6	12	31	170.2
Grasshopper Cr Gage 06890092-Regression Based Flow	**48.3**	**1.12**	**2.77**	**7.05**	**18.15**	**77.57**

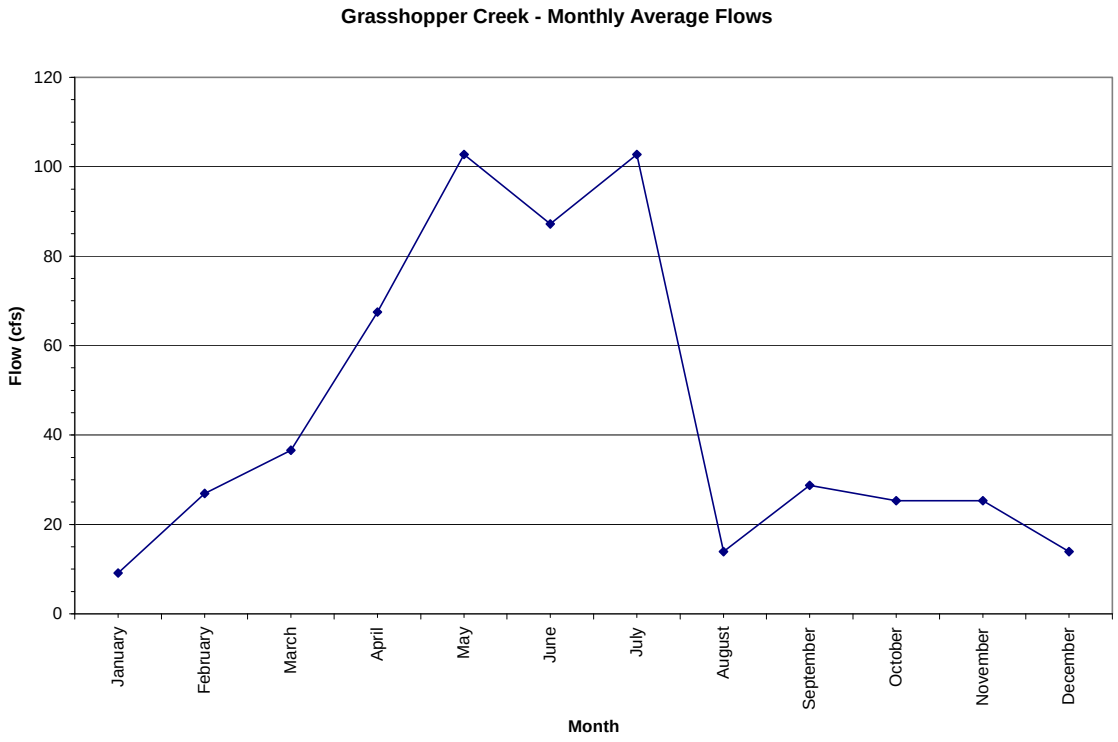
Table 2. Long Term Flow conditions in cfs for streams within the Grasshopper Creek watershed (Perry, 2004).

Stream (segment #)	Average	Percent of Flow Exceedance				
		90%	75%	50%	25%	10%
Upper Grasshopper Cr (20)	27.2	.03	.07	2.87	11.2	35.2
Otter Cr (41)	15.1	.01	.02	1.31	5.65	18.4
Mission Cr (40)	9.3	0	.01	.85	3.55	11.3
Clear Cr (19)	17.6	.01	.03	1.5	6.55	21.5

Precipitation: The average annual rainfall in the watershed is approximately 37.3 inches/year (2010, weather.com). Average monthly rainfall totals are illustrated in Figure 3.

Current Condition: This TMDL applies to the chronic aquatic life criterion for Atrazine. Data associated with the sampling stations within the watershed have been divided into two categories, the runoff period and the non-runoff period. The runoff period includes the months of April, May, June, and July, where runoff and atrazine applications are likely to occur. These months are associated with the time period atrazine is applied for herbicide control and is also susceptible to being washed off of the target fields if precipitation occurs and creates a runoff event. The non-runoff period accounts for months outside of the runoff season when the use of atrazine is typically not occurring and rainfall events are less intense, hence atrazine will not runoff of the fields during these months. Therefore, there is no atrazine impairment during the nonrunoff period.

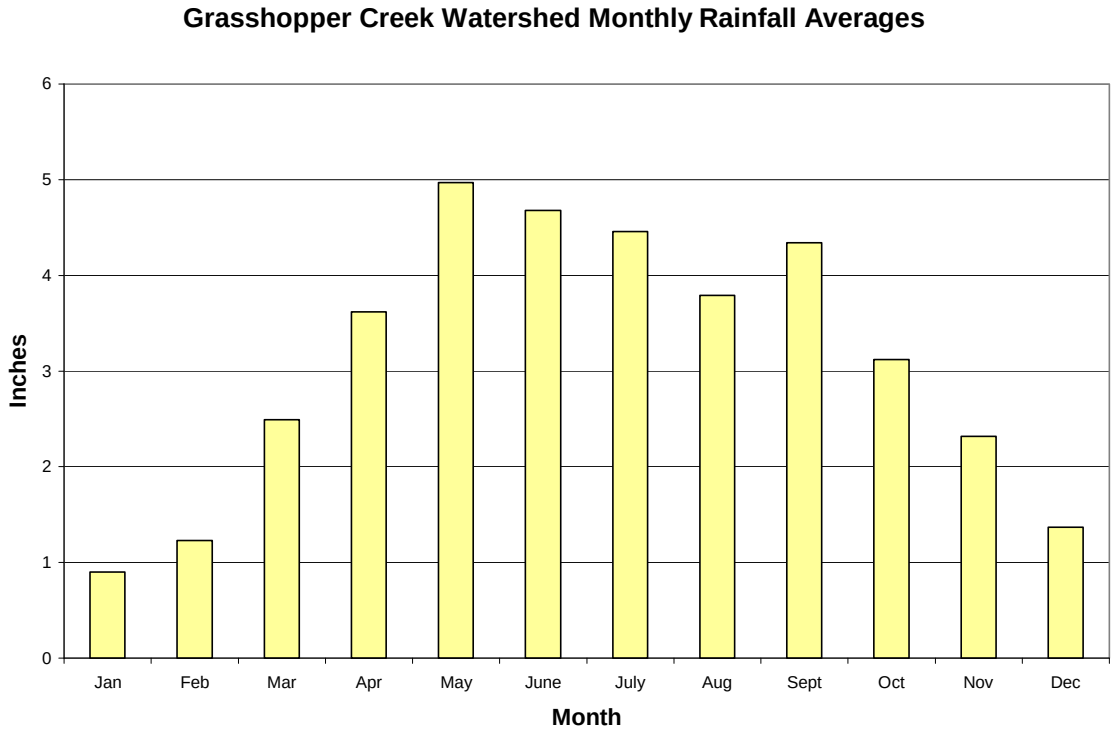
Figure 2. Monthly Average streamflows in Grasshopper Creek.



Streamflows increase substantially through the spring season from March to May, where higher average streamflows are maintained through July. Monthly rainfall averages tend to have a similar pattern as the average streamflow within the watershed, where the highest average rainfalls are seen from May through July. The three months (May, June, and July) with the highest average streamflow and rainfall also encompass the highest risk period for applying herbicides, to include atrazine. Atrazine applications that are

trailed by rainfall and runoff events lead to atrazine transport off the target fields and into the streams.

Figure 3. Monthly average rainfall in Grasshopper Creek.



During 1996-1998, Governor Graves conducted a water quality initiative in the Grasshopper Creek watershed to promote the reduction of atrazine, bactera and sediment. During this time KDHE sampled the seven sampling stations within the watershed on a bi-weekly basis. Six of the stations were only sampled during this two-year period and are now inactive, the other station remains an active rotational sampling station on Grasshopper Creek. The active station, SC603, has been sampled since 1992. Currently this station is sampled every four years with the next anticipated sampling year for this station to take place in 2012. During the sampling year, KDHE sampling occurs bimonthly and without consideration of rainfall events or atrazine application dates. Therefore the KDHE data set for station SC603 since 1998 typically misses the frequency and magnitude of elevated atrazine levels within the watershed.

Nonetheless, atrazine concentrations in the watershed average 3.74 µg/l during the runoff period at SC603. Based on the older station data from the inactive stations as seen in Table 3; Clear Creek, and the upper portions of Grasshopper Creek also averaged atrazine concentrations greater than 3 µg/l, with the highest concentration average being attributed to the furthest upstream sampling site on Grasshopper Creek (SC139).

Table 3. Average atrazine concentrations within the Grasshopper Creek watershed.

Station	Stream	Atrazine Avg. All (µg/l)	Atrazine Avg. Runoff Period April-July (µg/l)	Atz Avg. Nonrunoff Period (µg/l)
SC603	Grasshopper Cr.	1.75	3.74	0.61
SC135*	Brush Cr	1.06	2.12	0.37
SC136*	Clear Cr	1.63	3.42	0.45
SC137*	Grasshopper Cr	1.99	4.36	0.52
SC139*	Grasshopper Cr	2.10	4.73	0.40
SC138*	Mission Cr	0.88	1.45	0.51
SC140*	Otter Cr	1.81	2.62	1.36

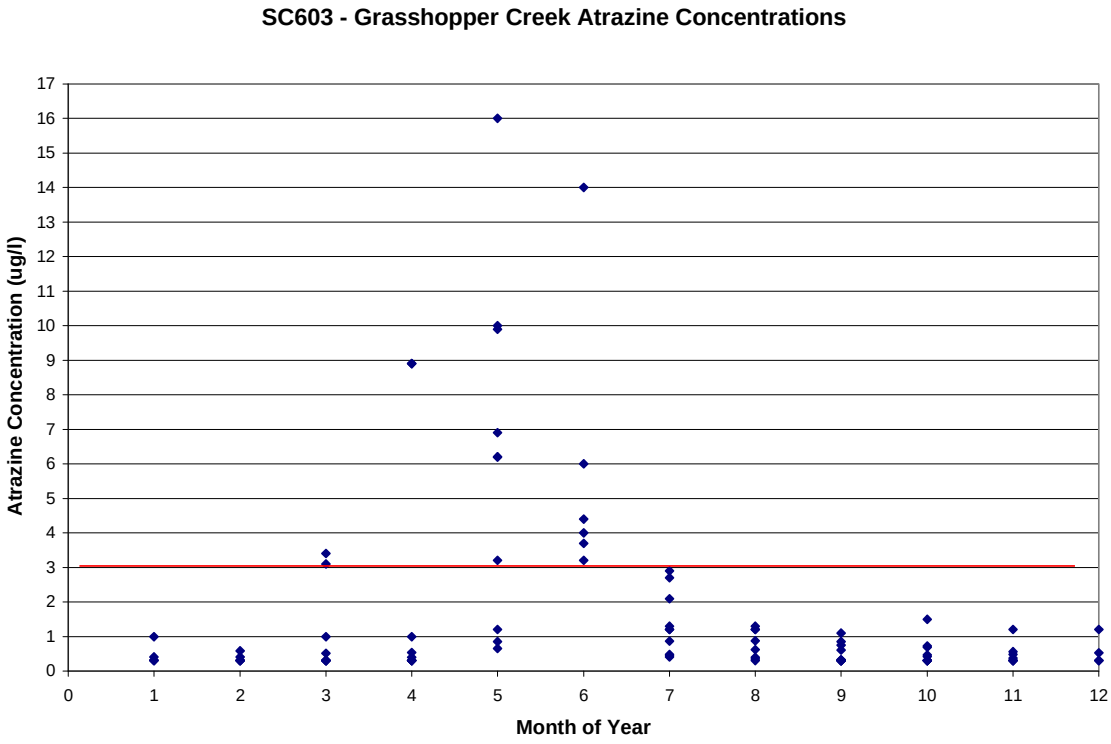
* - 1996-1998 Governor's Water Quality Initiative

All atrazine exceedances greater than 3 µg/l occurred during the runoff period on Brush Creek, Clear Creek, and the upper portion of Grasshopper Creek. Almost half of the 18 samples on Otter Creek that were greater than 3 µg/l occurred during the nonrunoff period months of November, December, January, and March. The active Grasshopper Creek station SC603 had all but one of the 15 samples that was above 3 µg/l occur during the runoff period.

Table 4. Summary of total samples exceeding atrazine criterion within the Grasshopper Creek watershed.

Station	Creek	Total # of Samples	Total Samples > 3 µg/l	% of total > 3 µg/l	# of Runoff Period (Apr-July) Samples	# of Runoff Period Samples >3 µg/l	**% of Runoff Period > 3 µg/l**	Period of Record
SC135	Brush Cr	74	9	12	29	9	**31**	1996-1998
SC136	Clear Cr	73	12	16	29	12	**41**	1996-1998
SC137	Grasshopper Cr	85	16	19	32	16	**50**	1996-1998
SC138	Mission Cr	75	4	5	29	4	**14**	1996-1998
SC139	Grasshopper Cr	102	18	18	40	18	**45**	1996-1998
SC140	Otter Cr	79	14	18	28	8	**29**	1996-1998
SC603	Grasshopper Cr	80	15	19	31	14	**45**	1992-2008

Figure 4. Atrazine detections at SC603 by sampling month (1992-2008).



As seen in Table 5, average monthly atrazine concentrations exceeding 3 µg/l during the runoff period are seen in the months of May and June throughout the watershed. The highest average concentrations occur in Grasshopper Creek during May, likely due to the prevalent use of atrazine during this time period and because of the susceptibility to heavier rainfall events that contribute runoff.

Table 5. Summary of atrazine samples during the runoff period for stations in the Grasshopper Creek watershed.

Station	Location	Month	# of Samples	# of Samples > 3 µg/l	Monthly Atrazine Avg. in µg/l
SC135	Brush Cr	April	8	0	0.32
		May	8	4	2.67
		June	7	5	4.10
		July	6	1	1.46
SC136	Clear Cr	April	8	0	0.31
		May	8	5	5.69
		June	7	6	5.4
		July	6	1	2.23
SC137	Grasshopper Cr	April	7	0	0.72
		May	10	8	7.3
		June	7	5	5.63
		July	8	3	2.77
SC138	Mission Cr	April	8	1	1.54
		May	9	3	1.89
		June	6	0	1.34
		July	6	0	0.78
SC139	Grasshopper Cr	April	11	0	0.69
		May	12	8	8.45
		June	9	8	6.70
		July	8	2	2.49
SC140	Otter Cr	April	7	0	0.55
		May	8	6	5.13
		June	6	2	3.48
		July	7	0	1.10
SC603	Grasshopper Cr	April	9	2	2.33
		May	10	7	6.11
		June	6	6	5.88
		July	10	0	1.36

As seen in Figure 5, the higher atrazine concentrations are seen in the runoff period during higher flow conditions. This figure illustrates the conditions that contribute to higher atrazine spikes within the watershed, result from atrazine applications (typically in May or June) being followed by rainfall events that contribute to overland runoff and higher stream flow conditions.

Figure 5. Atrazine sample concentrations relative to the flow condition for the runoff (April-July) and nonrunoff period at station SC603 on Grasshopper Creek.

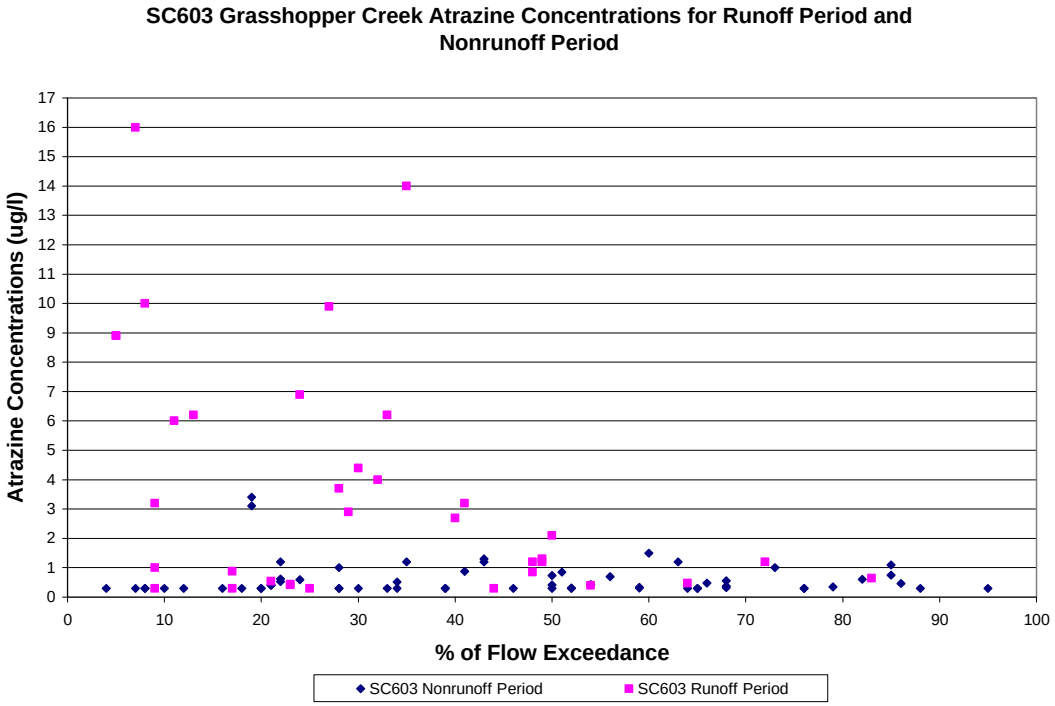
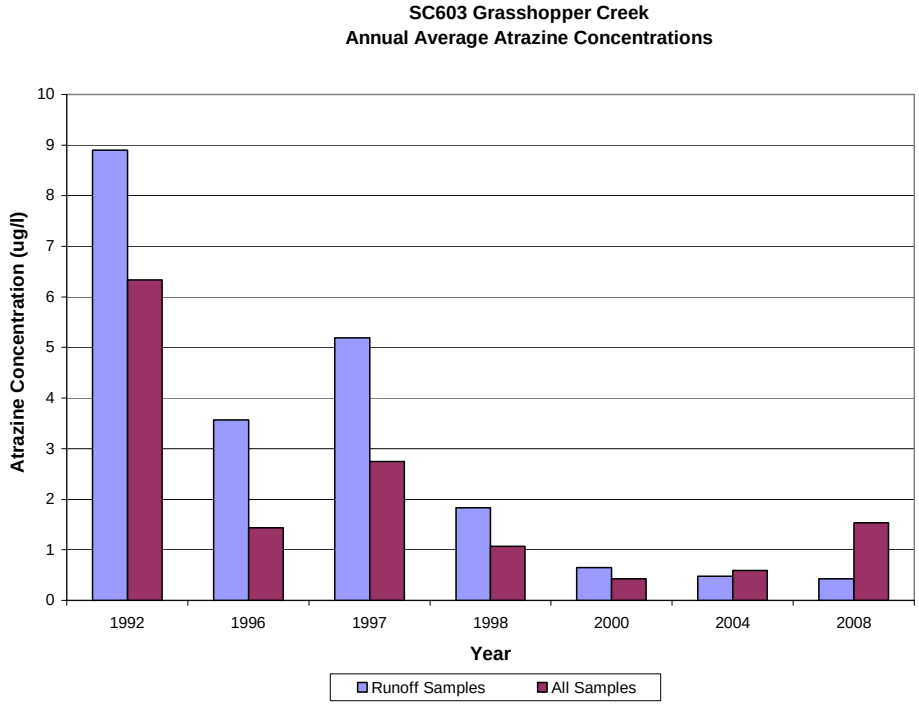


Figure 6. Annual average atrazine concentrations at SC603 for the runoff period (April-July) and for the overall annual concentration average.



Desired Endpoints of Water Quality (Implied Load Capacity for Atrazine) in Grasshopper Creek:

The ultimate endpoint for this TMDL will be to achieve the Kansas Water Quality Standards fully supporting chronic aquatic life support. The current standard of 3 µg/l for atrazine was utilized to establish the TMDL. Seasonal variation has been incorporated in this TMDL through the documentation of the seasonal (April-July) occurrence of elevated atrazine levels.

The following endpoints will define achievement of the water quality standards.

1. Average monthly atrazine exceedances over 3 µg/l will not occur in Grasshopper Creek or the streams within the Grasshopper Creek watershed.
2. No individual sample of atrazine will exceed 170 µg/l.
3. Overall annual concentrations will average below 3 µg/l at SC603.

The following milestones will establish the baseline of current water quality conditions to assess interim progress in the watershed.

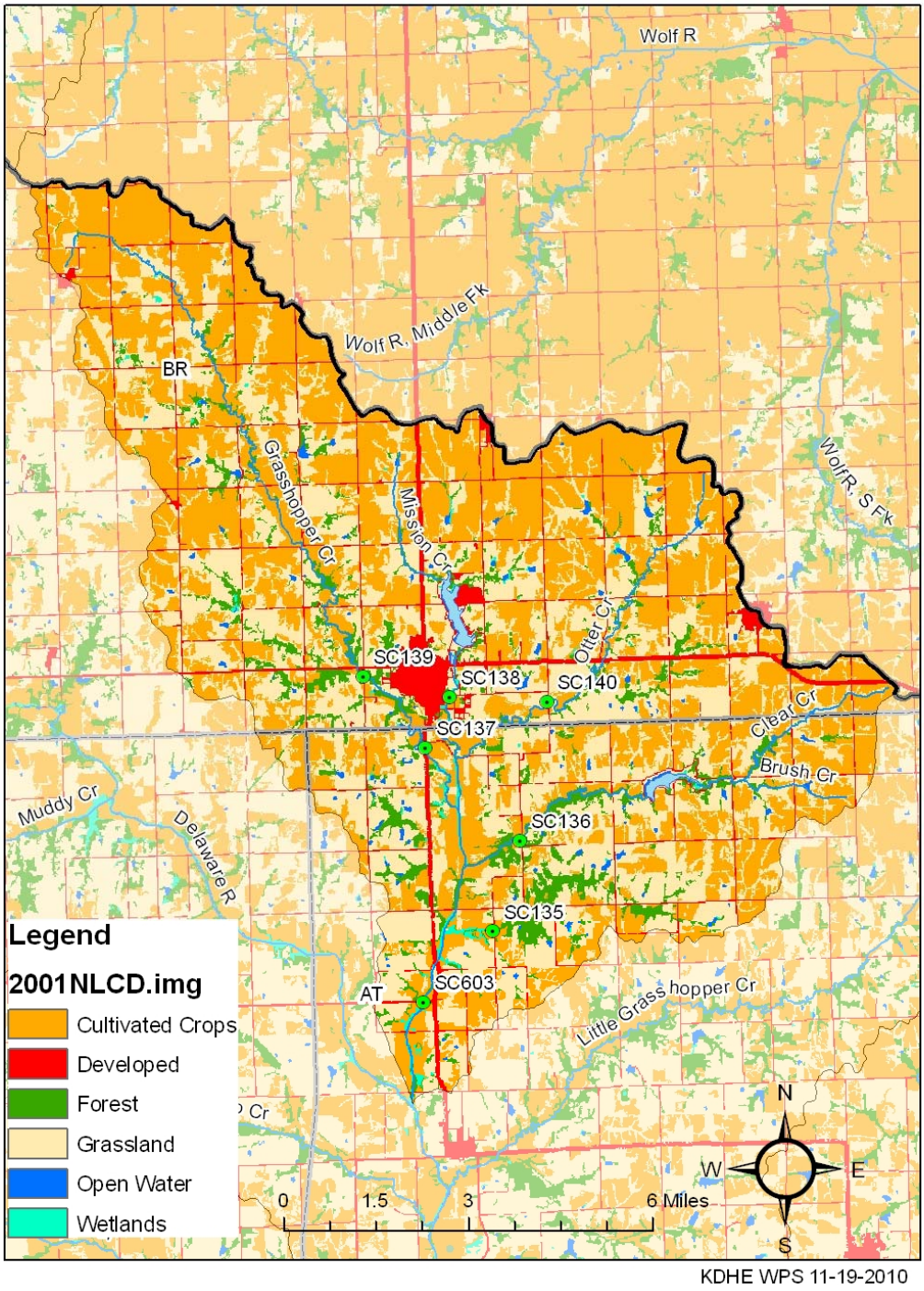
1. There will be no atrazine digressions over 3 µg/l in Grasshopper Creek in any month other than May or June.
2. There will be no digression of atrazine over 3 µg/l in streamflow throughout the watershed during flows less than the long term mean daily flow on Grasshopper Creek.

3. SOURCE INVENTORY AND ASSESSMENT

The primary source of atrazine entering the Grasshopper Creek watershed is attributed to the application of atrazine prior to rainfall events that lead to overland runoff of cropland during the months of April, May, June, and July. Atrazine has been widely utilized since the 1960's for selective control of broadleaf and grass weeds in corn and grain sorghum. There is an economic value associated with the application of atrazine to specific crops. However, atrazine is highly soluble in water and is susceptible to removal from cropland during overland runoff events, which impacts water quality. The actual timing of atrazine applicaton in each sub-watershed, the localized rainfall over each stream, the slope and soil conditions in each subwatershed and the impact of any pesticide Best Management Practice utilized by individual farmers complicates the true relation between rain and atrazine loading.

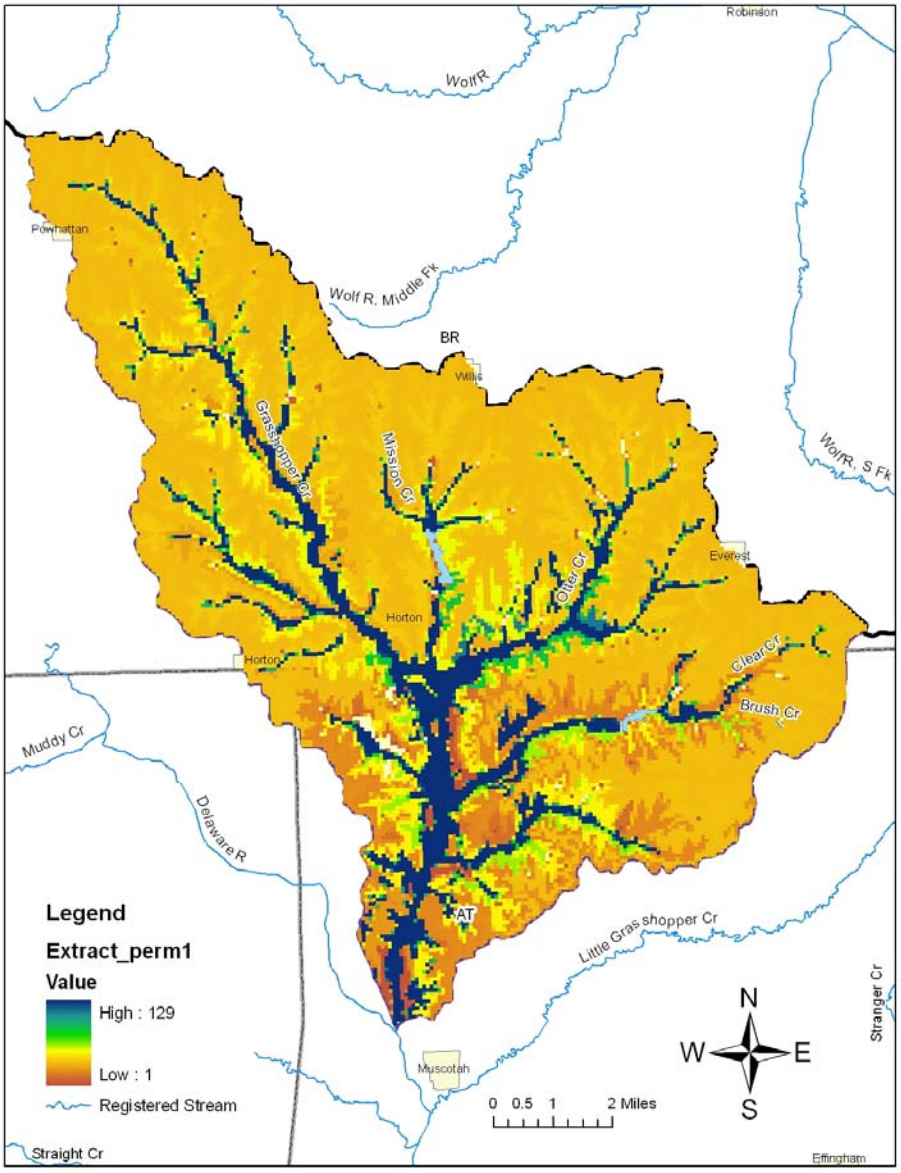
Land Use: The land cover in the Grasshopper Creek watershed includes 49% cropland, 36% grassland, 6% forest, 6% roads/developed, and 3% open water/wetlands. Cropland is the predominant land cover lying along the upper portions and main segment of Grasshopper Creek. Atrazine utilization and application is probable in the designated cropland areas that consist of corn and grain sorghum acres.

Figure 7. Grasshopper Creek Landuse Map.



Point Sources: There are four permitted NPDES waste treatment facilities located within the Grasshopper Creek watershed (see Appendix A). Since atrazine is associated with agricultural nonpoint source pollution, point sources are not a source of impairment under this TMDL.

Figure 8. Grasshopper Creek watershed permeability map.



Contributing Runoff: The watershed of Grasshopper Creek has a mean soil permeability value of 0.41 inches/hour, ranging from 0.01 to 1.29 inches/hour according to the NRCS STATSGO database. According to a USGS open-file report (Juracek, 2000), the threshold soil-permeability values that represents very high, high, moderate, low, very low, and extremely low rainfall intensity, were set at 3.43, 2.86, 2.29, 1.71,

1.14, and 0.57”/hour, respectively. The lower rainfall intensities generally occur more frequently than the higher rainfall intensities. The higher soil-permeability thresholds imply a more intense storm during which areas with higher soil permeability potentially may contribute runoff. Runoff is chiefly generated as infiltration excess with rainfall intensities greater than the soil permeability. As soil profiles become saturated, excess overland flow is produced. For the Grasshopper Creek watershed, runoff will be produced by a rainfall event producing 0.57 inches/hour rain in approximately 84% of the watershed, and a rainfall event producing 1.29 inches/hour of rain will produce runoff over the entire watershed based on the soil permeability values in the watershed.. Cropland runoff attributes to the atrazine impairment within the watershed.

Livestock Waste Management Systems: There are eight certified or permitted confined animal feeding operations (CAFOs) within the Grasshopper Creek watershed (see Appendix B). Livestock facilities do not contribute to the atrazine impairment within the watershed.

County Agricultural Statistics: According to the United States Department of Agriculture National Agricultural Statistics Service, herbicides are estimated to have been applied to 95% of the total row crop acreage in Brown County and to 89% of the total row crop acreage in Atchison County. County census summaries for Brown and Atchison counties detail the total number of acres herbicides were applied in the available census years, as seen in Table 6. As detailed in Table 7, a summary of the most recently available County Farm surveys detail the number of acres planted in row crops, of which atrazine application was likely.

Table 6. USDA National Agricultural Statistics Service stats for Brown and Atchison Counties.

Year	County	Acres Herbicide Applied
1997	Brown	184,719
2002	Brown	188,197
2007	Brown	203,864
1997	Atchison	92,730
2002	Atchison	110,325
2007	Atchison	104,365

Table 7. Kansas Farm Facts for Brown and Atchison Counties (USDA, 2008 and 2010).

County	Survey Year	Corn Acres Planted	Sorghum Acres Planted	Soybeans Acres Planted	Total Row Crop Acres
Brown	2006	104,900	NA	112,000	216,900
Brown	2007	117,400	800	97,100	215,300
Brown	2008	104,500	900	113,000	218,400
Brown	2009	119,000	NA	103,000	222,000
Atchison	2006	53,100	1,800	62,300	117,200
Atchison	2007	59,500	900	56,600	117,000
Atchison	2008	57,500	600	65,400	123,500
Atchison	2009	64,000	NA	63,000	127,000

4. ALLOCATION OF POLLUTION REDUCTION RESPONSIBILITY

The application and subsequent runoff of atrazine from cropland in the Grasshopper Creek watershed is the primary factor for the elevated amounts of atrazine seen in the watershed, particularly in May and June.

Point Sources: Since this pollutant is associated with agricultural nonpoint source pollution, a Wasteload Allocation of zero will be assigned to point sources for atrazine under this TMDL.

Nonpoint Sources: All load allocations will be assigned to station SC603 on Grasshopper Creek. The TMDL and load allocations are based on a load duration curve approach as seen in Figure 9. Table 8 details the atrazine TMDL based on the monthly average streamflows over the period of record (see Figure 2) and compares these against the current monthly average atrazine concentrations and loads during the months within the runoff period. The months of June and July are the only months within this period that require load reductions. The estimated necessary average load reduction for the combined May and June period is 53% at station SC603.

Table 9 details the TMDL at the average flow condition at station SC603 over the period of record, which applies to any given day annually. The Load Allocation at the average flow condition is 0.704 lbs/day.

Figure 9. Grasshopper Creek TMDL

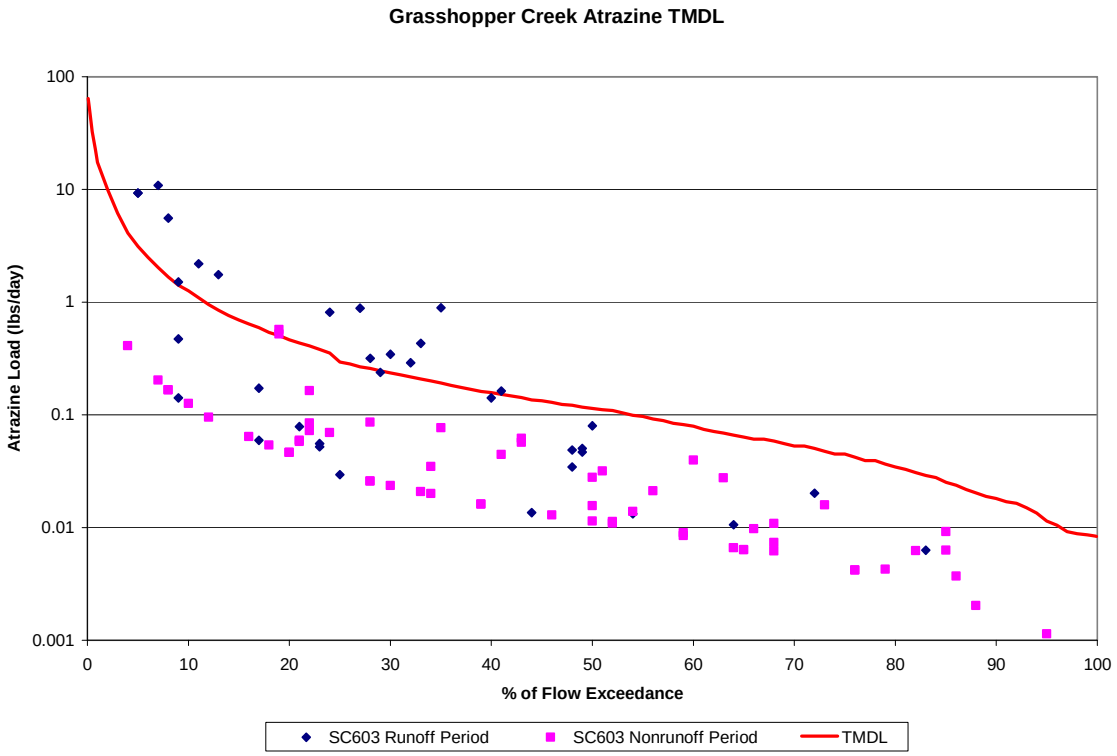


Table 8. Grasshopper Creek Runoff Period Summary and TMDL.

Sampling Station	Month	Atrazine Average (*u*g/L)	Avg. Flow (cfs)	Avg. Load in lbs/day	TMDL (lbs/day)	Load Reduction (%)
SC603 - Grasshopper Cr	April	1.51	67.49	0.55	1.09	0
	May	6.69	102.78	3.71	1.67	55
	June	5.88	87.16	2.77	1.41	49
	July	1.50	102.78	0.83	1.67	0
	May-June	**6.37**	**95**	**3.27**	**1.54**	**53**
	Annual	**1.86**	**48.3**	**0.49**	**0.782**	**0**

Defined Margin of Safety: The margin of safety is implicit since this TMDL applies to Grasshopper Creek under all conditions when the only period that substantiates a TMDL are during the months of May and June in the runoff period. In addition, the TMDL identifies necessary load reductions for the months of May and June when the annual atrazine average requires no load reductions.

Table 9. Grasshopper Creek TMDL at average flow.

Wasteload Allocation	Load Allocation	Margin of Safety	TMDL
0 lbs/day	0.704 lbs/day	0.078 lbs/day	0.782 lbs/day

State Water Plan Implementation Priority: There is currently a High Priority Atrazine TMDL for Mission Lake within this watershed and the Kansas Department of Agriculture has established a Pesticide Management Area for the entire Delaware Watershed. In addition, the probability to achieve the endpoints of this TMDL are high with the implementation of atrazine best management practices. This TMDL will be **Medium Priority** for implementation.

Unified Watershed Assessment Priority Ranking: The Grasshopper Creek watershed lies within the Delaware River Subbasin (HUC8: 10270103) with a priority ranking of 3 (Highest Priority for restoration work).

Priority Stream Segments: The priority focus should be the implementation within row crop adjacent to Grasshopper Creek and its primary tributaries within the watershed.

5. IMPLEMENTATION

Desired Implementation Activities: The best way to reduce atrazine loading caused by agricultural practices is to ensure that Best Management Practices (BMPs) are being implemented within the watershed. In addition, it is important to educate the agricultural community on atrazine application rates, timing, alternatives, and label instructions. The Kansas State Extension Office has numerous publications available that will assist in the implementation of BMPs throughout the watershed.

1. Implement proper mix of pesticide application best management practices, including: soil incorporation, application timing and rates, split applications, reduced soil-applied rates, postemergence applications, band applications, alternative weed control methods and buffer zones.
2. Implement necessary best management pratices at storage and handling sites.
3. Install necessary grass buffer strips along streams.
4. Ensure label compliance by applicators

Implementation Programs Guidance:

Nonpoint Source Pollution Technical Assistance – KDHE

a. Support Section 319 demonstration projects for reduction of atrazine runoff from corn and grain sorghum cropland.
b. Provide technical assistance on practices geared to the establishment of vegetative buffer strips.

c. Guide federal programs, such as the Environmental Quality Improvement Program & Conservation Security Program, to support installation of pesticide Best Management Practices to the cropland drained by the Grasshopper Creek watershed.
d. Coordinate and support the Delaware WRAPS group to incorporate a long-term plan to comprehensively reduce the loading and delivery of pesticides in the Grasshopper Creek watershed.

Water Resource Cost Share & Nonpoint Source Pollution Control Programs – SCC:

a. Support installation of pesticide management sites for storage, mixing and handling of atrazine and other pesticides.
b. Support pesticide best management practices to minimize pesticide runoff.

Water Quality Standards – KDHE

a. Request EPA finalize its aquatic life criteria for atrazine.
b. Incorporate revised atrazine criteria into Kansas surface water quality standards once criteria are finalized by EPA.

Riparian Protection Program – SCC

a. Establish or restablish natural riparian systems, including vegetative filter strips along small tributarites.
b. Develop riparian restoration projects in cropland areas.

Buffer Initiative Program – SCC

a. Install buffer strips along small streams.
b. Work in conjunction with federal Conservation Reserve Enhancement Program and Conservation Security Program to hold marginal riparian land out of production.

Extension Outreach and Technical Assistance – Kansas State University

a. Educate corn and grain sorghum producers on pesticide management and effective BMPs that reduce atrazine runoff.
b. Provide technical assistance on buffer strip design, techniques to minimize cropland runoff and construction of pesticide handling pads.
c. Provide planning assistance to local interests to support WRAPS activities in the Grasshopper Creek watershed.

Pesticide Management Program – Kansas Department of Agriculture

Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) authorizes a State to regulate the sale or use of any federally registered pesticide in the State (FIFRA §24 (a)). Under FIFRA, Kansas is authorized to initiate the process of making label changes on the use, application and provision of environmental protection of pesticides, if necessary to assure the attainment of the Water Quality Standard within this basin. The Kansas Department of Agriculture is the designated agency in Kansas that has pesticide management authority. In 1995, the Kansas Department of Agriculture designated the Delaware River Basin as a Pesticide Management Area to reduce atrazine loads to Perry

Lake, through voluntary adoption of management practices. Atrazine label changes followed with more restrictive use and application. Among the activities promoted by the Kansas Department of Agriculure:

a. Implement pesticide bulk containment regulations
b. Ensure label compliance by pesticide applicators
c. Harmonize product labels regarding use and protection measures
d. Implement any applicable provisions of the Atrazine Interim Reregistration Eligibility Decision by EPA
e. Continue basin pesticide education efforts through Kansas State and commodity associations.

Time Frame for Implementation: Pollutant reduction strategies and pollutant source assessment should be initiated within the Grasshopper Creek watershed in 2011 through the 9-element watershed plan for the Delaware WRAPS. Pollutant reduction practices and implementation activities within the watershed should be initiated by 2012 and continue through 2020.

Targeted Participants: The primary participants for implementation will be agricultural operations immediately adjacent to stream within the watershed that apply atrazine. Conservation district personnel and county extension agents should conduct a detailed assessment of sources adjacent to streams within the watershed over 2011. Implementation activities should target those areas with the corn and sorghum acreage that are located within a half mile of the streams within the watershed.

Milestone for 2015: In accordance with the TMDL development schedule for the State of Kansas, the year 2015 marks the next cycle of 303(d) activities in the Kansas Lower Republican Basin to review data from Grasshopper Creek to assess improved conditions. Should the impairment continue, adjustments to source assessment, allocation, and implementation activities may occur.

Delivery Agents: The primary deliver agents for program participation will be the State Conservation Commission, the Kansas State University Extension Service and the Delaware WRAPS teams. Implementation decisions and scheduling will be guided by planning documents prepared through Delaware WRAPS.

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

1. K.S.A 2-2439 empowers the Secretary of Agriculture to oversee pesticide management, registration and use in the state.

2. K.S.A 2-2472 empowers the Secretary of Agriculture to establish Pesticide Management Areas to protect public health, safety and welfare and the natural resources of the state from pesticide pollution.

3. 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.

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 nonpoint 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*, including selected Watershed Restoration and Protection Strategies.

8. The Kansas Water Plan and the Kansas-Lower Republican 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.

9. The Federal Insecticide, Fungicide and Rodenticide Act authorizes the state to initiate the process of making label changes on the use, application and provision of environmental protection of pesticides.

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 programs supporting water quality protection through the WRAPS program. This watershed and its TMDL are Medium Priority consideration for funding.

Effectiveness: The key to effectiveness in reducing atrazine levels in the Grasshopper Creek watershed will be determined by the participation of corn and grain sorghum producers in the watershed to reduce inputs, particularly during the application window of wet weather between April and July.

6. MONITORING

KDHE will continue to collect seasonal samples from Grasshopper Creek on a rotational basis, sampling every quarter during the year for every fourth year. The next round of sampling should take place in 2012. It would be desirable to increase the sampling schedule for SC603 during the months of May and June once implementation activities have been initiated since these months are associated with the months atrazine is applied and load reductions are necessary. KDHE subwatershed sampling, as part of the Delaware WRAPS implementation evaluation, may include monitoring atrazine coming out of the Grasshopper Creek drainage.

7. FEEDBACK

Public Notice: An active internet website was established at http://www.kdheks.gov/tmdl/index.htm to convey information to the public on the general establishment of TMDLs and specific TMDLs for the Kansas Lower Republican Basin.

Public Hearing: A Public Hearing on the Kansas Lower Republican TMDLs was held on August 30, 2011 in Holton to receive comments on this TMDL.

Basin Advisory Committee: The Kansas Lower Republican Basin Advisory Committee met to discuss the TMDLs in the basin on September 30, 2010 in Lawrence, March 17, 2011 in Manhattan, June 16, 2011 in Lawrence, and September 29, 2011 in Topeka.

Watershed Restoration and Protection Strategy Group: This TMDL has been reviewed in August 2011 by the Delaware Subbasin WRAPS group.

Milestone Evaluation: In 2015, evaluation will be made as to the degree of implementation which has occurred within the watershed pursuant to the Delaware WRAPS 9-element plan. Subsequent decisions will be made regarding the implementation approach, priority of allotting resources for implementation and the need for additional or follow up implementation in this watershed at the next TMDL cycle for this basin in 2015 with consultation from local stakeholders and WRAPS teams.

Consideration for 303(d) Delisting: Grasshopper Creek will be evaluated for delisting under section 303(d), based on the monitoring data over 2011-2020. Therefore, the decision for delisting will come about in the preparation of the 2020-303(d) list. Should modifications be made to the applicable water quality criteria during the implementation period consideration for delisting, desired endpoints of this TMDL and implementation activities might 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 anticipate revision would come in 2012, which will emphasize implementation of WRAPS activities. At that time, incorporation of this TMDL will be made into the WRAPS. Recommendations of this TMDL will be considered in the *Kansas Water Plan* implementation decisions under the State Water Planning Process for Fiscal Years 2011-2020.

Revised December 6, 2011

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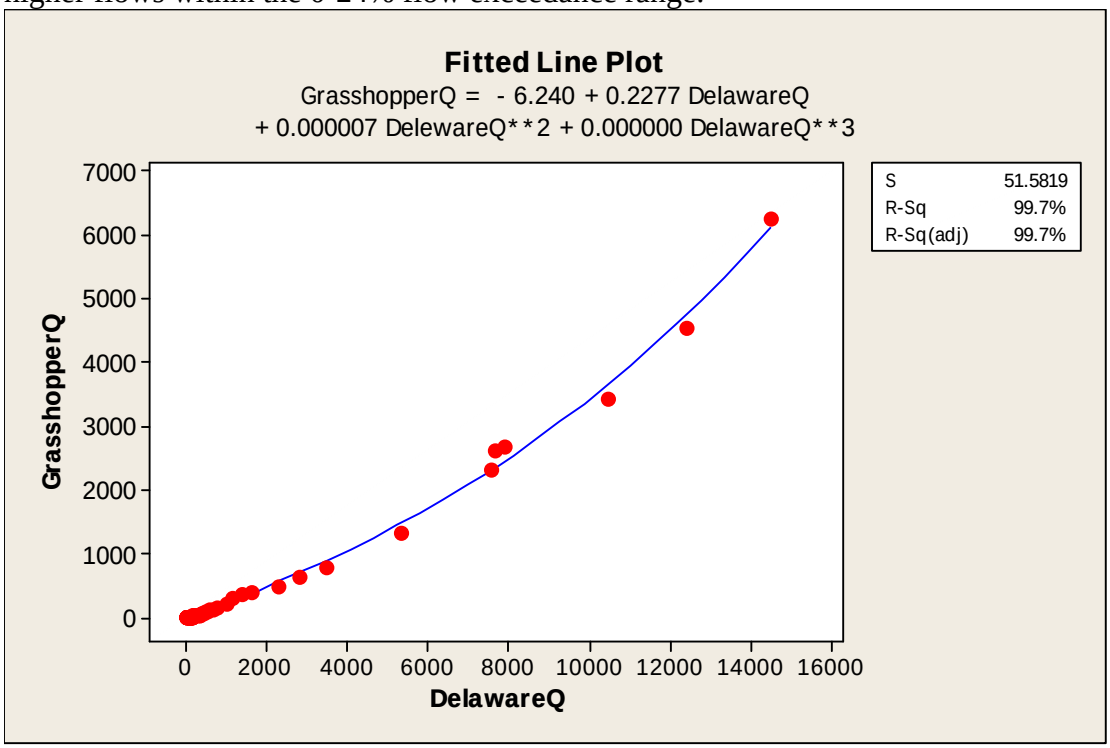
Appendix A – NPDES Facilities in Grasshopper Creek watershed.

Kansas Permit Number	Federal Permit Number	Facility	Type	Design Flow (MGD)	Permit Expires	Atrazine WLA (lbs/day)
M-KS24-OO01	KS0047465	Horton, City of	Trickling Filter/UV	0.248	06/30/2015	0
M-KS18-OO01	KS0027171	Everest, City of	Two-Cell Lagoon	.0327	01/31/2011	0
I-KS24-CO01	KS0092185	Horton Municipal Power Plant	Seasonal Cooling Water	0.281 Avg	12/31/2012	0
I-KS24-PO01	KS0099708	Mission Lake Sediment Removal Project	Sediment Removal	NA	08/31/2014	0

Appendix B – Animal Feeding Operations in Grasshopper Creek Watershed

Permit	County	Type	Head	Atrazine WLA (lbs/day)
A-KSAT-B001	Atchison	Beef	80	0
A-MOBR-S012	Brown	Swine	800	0
A-KSBR-BA06	Brown	Beef	150	0
A-KSAT-C001	Atchison	Beef	4999	0
A-KSBR-BA04	Brown	Beef	600	0
A-KSBR-BA05	Brown	Beef	100	0
A-KSBR-BA03	Brown	Beef	300	0
A-KSAT-S013	Atchison	Swine, Beef	880	0

Appendix A. Flow Regression utilized to establish flows on Grasshopper Creek for higher flows within the 0-24% flow exceedance range.



Flow regression utilized to establish flows on Grasshopper Creek for flows within the 25-100% flow exceedance range.