

MARAIS DES CYGNES BASIN TOTAL MAXIMUM DAILY LOAD

**Waterbody: One Hundred and Forty Two Mile Creek/Upper Marais des Cygnes River
Water Quality Impairment: Dissolved Oxygen**

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasin: Upper Marais des Cygnes **County:** Osage, Wabaunsee and Lyon

HUC 8: 10290101

HUC 11 (HUC 14s): **010** (030, 040, 050 and 060)

Drainage Area: 142.1 square miles

Main Stem Segments: WQLS: 37, 38 (Marais des Cygnes River) and 40 (One Hundred and Forty Two Mile Creek); starting at Melvern Lake (Marais des Cygnes River) and traveling upstream to headwaters of One Hundred and Forty Two Mile Creek in southern Wabaunsee County (**Figure 1**).

Tributary Segment: WQLS: Elm Creek (39)*
 Chicken Creek (70)*
 Locust Creek (69)*
 WQLS: Hill Creek (71)
 Non-WQLS: Duck Creek (41)
 Non-WQLS: Mud Creek (91)

* - Segments incorrectly assessed as impaired in 1998 303(d) list.

Designated Uses: Expected Aquatic Life Support, Primary Contact Recreation; Domestic Water Supply; Food Procurement; Ground Water Recharge; Industrial Water Supply Use; Irrigation Use; Livestock Watering Use for Main Stem Segment.

 Expected Aquatic Life Support, Secondary Contact Recreation and Food Procurement on Hill Creek.

1998 303(d) Listing: Table 1 - Predominant Non-point Source and Point Source Impacts

Impaired Use: Expected Aquatic Life Support

Water Quality Standard: Dissolved Oxygen: 5 mg/L (KAR 28-16-28e(c)(2)(A))

2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

Level of Support for Designated Use under 1998 303(d): Not Supporting Aquatic Life

Monitoring Sites: Station 579 near Reading

Period of Record Used: 1990-2000 for Station 579 (Figure 2)

Flow Record: Marais des Cygnes River near Reading (USGS Station 06910800); 1971 to 1999.

Long Term Flow Conditions: 10% Exceedence Flows = 186 cfs, 7Q10 = 1 cfs

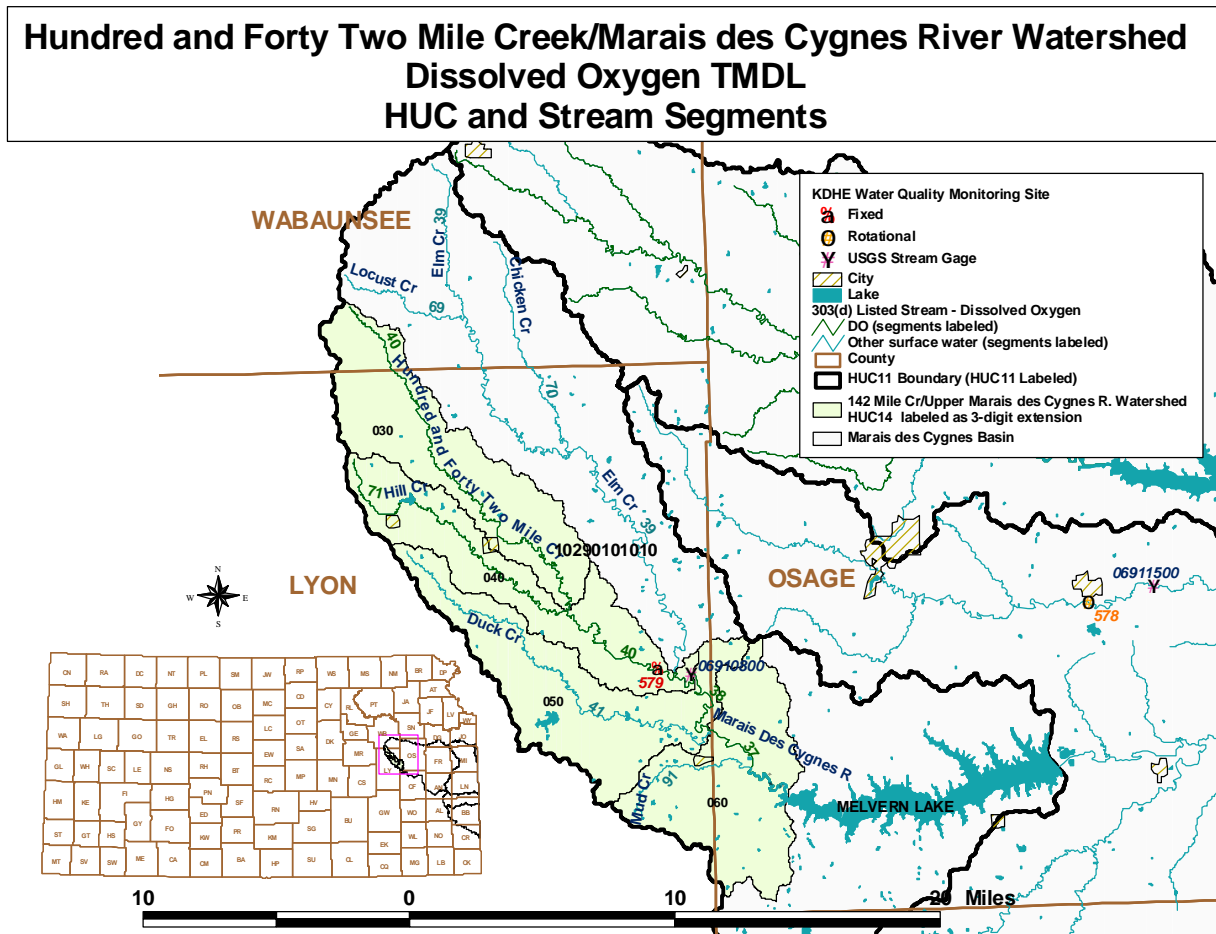


Figure 1

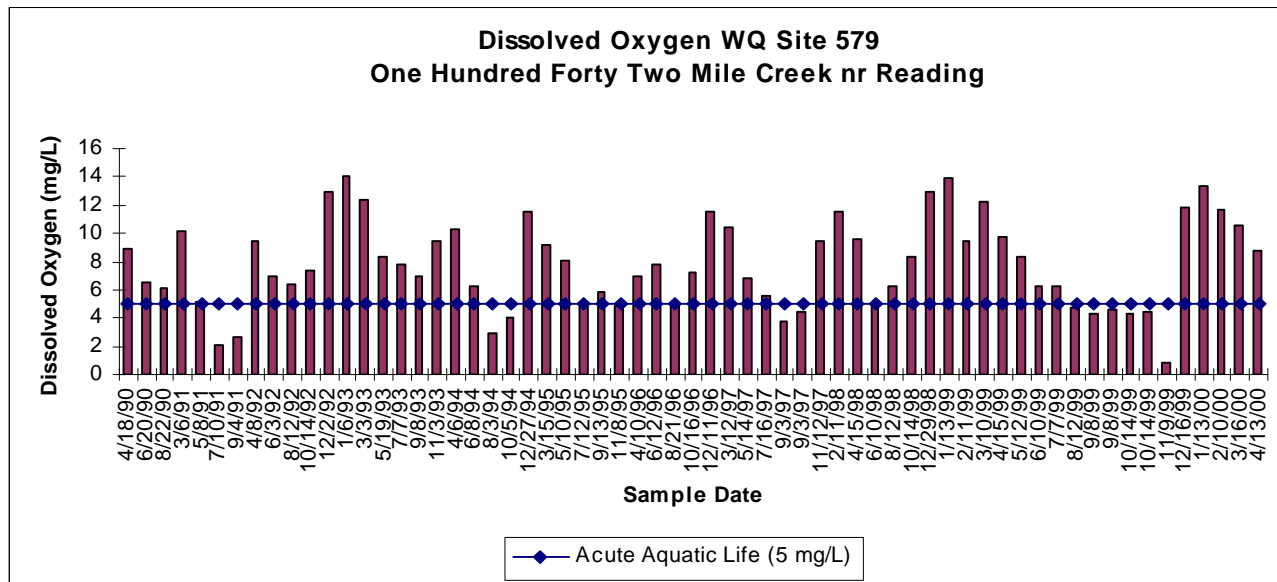


Figure 2

Current Conditions: 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 site were categorized for each of the three defined seasons: Spring (Mar-Jul), Summer-Fall (Aug-Oct) and Winter (Nov-Feb). High flows and runoff equate to lower flow durations, baseflow and point source influences generally occur in the 75-99% range. Load curves were established for the Aquatic Life criterion by multiplying the flow values for the Marais des Cygnes River near Reading along the curve by the applicable water quality criterion and converting the units to derive a load duration curve of pounds of DO per day. This load curve graphically displays the TMDL since any point along the curve represents water quality at the standard at that flow. Historic excursions from water quality standards (WQS) are seen as plotted points below the load curves. Water quality standards are met for those points plotting above the applicable load duration curves (**Figure 3**).

Excursions were seen in all seasons and are outlined in Table 1. Thirty eight percent of the Summer-Fall samples and 6% of Spring samples were below the aquatic life criterion. Ten percent of the Winter samples were under the aquatic life criterion. Overall, 18% of the samples were under the criterion. This would represent a baseline condition of partial-support of the impaired designated use.

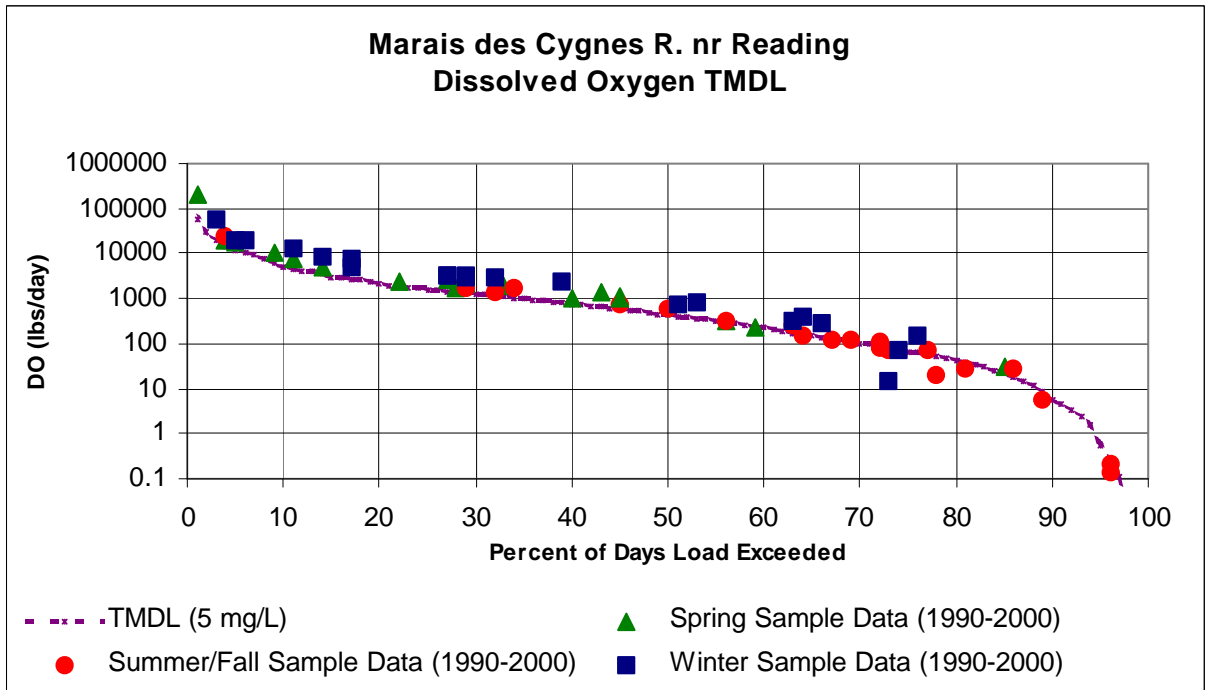


Figure 3

No DO violations have been encountered at flows exceeding 8.6 cfs on the Marais des Cygnes River near Reading, therefore a critical low flow can be identified on the Marais des Cygnes as those flows of 8.6 cfs or less.

Table 1
NUMBER OF SAMPLES UNDER DISSOLVED OXYGEN STANDARD OF 5 mg/L BY FLOW

| Station | Season | 0 to 10% | 10 to 25% | 25 to 50% | 50 to 75% | 75 to 90% | 90 to 100% | Cum Freq. |
|--|--------|----------|-----------|-----------|-----------|-----------|------------|------------|
| Marais des Cygnes River near Reading (579) | Spring | 0 | 0 | 0 | 1 | 0 | 0 | 1/18 = 6% |
| | Summer | 0 | 0 | 0 | 3 | 3 | 2 | 8/21 = 38% |
| | Winter | 0 | 0 | 0 | 2 | 0 | 0 | 2/21 = 10% |

A watershed comparison approach was taken in developing this TMDL. The Salt Creek watershed (Water Quality Sampling Site 578 in the watershed was not impaired by low DO) has similar land use characteristics and is located east of the One Hundred and Forty Two Mile Creek/Marais des Cygnes River watershed. The relationship of DO to Biochemical Oxygen Demand (BOD), water temperature, turbidity, nitrate, phosphorus and stream flow were used in the comparisons.

Table 2a outlines those water quality data for the samples taken on the same date for the two sites of interest between 1994 and 2000 when DO was *below* the aquatic life criterion for sample site 579 and *above* the aquatic life criterion for the comparison site 578. At sampling site 579 the

average BOD concentration was 1.9 mg/L higher than that of comparison site 578 while the average nitrate, phosphorus, temperature, turbidity and flow were much the same for both sites. This indicates that, in addition to the naturally driven climatic factors of extremely low flow and high water temperature which cause occasional DO excursions, a probable oxygen demanding substance load is being added to the One Hundred and Forty Two Mile Creek/Marais des Cygnes River watershed upstream of site 579 and under certain conditions is likely a factor influencing some of the DO violations.

Table 2b outlines those water quality data for the samples taken on the same date for the two sites of interest between 1994 and 2000 when DO was below the aquatic life criterion for both sites. At sampling site 579 and 578 average BOD was much lower than those excursions seen in Table 2a which indicates that there are instances in the One Hundred and Forty Two Mile Creek/Marais des Cygnes River watershed when DO excursions can only be linked to low flow and high water temperature.

Table 2a

| COL DATE | DO (mg/L) | | BOD (mg/L) | | TEMP Degrees C | | TURBIDITY (FTU) | | NITRATE (mg/L) | | TPHOS (mg/L) | | Flow (cfs) | Flow (cfs) |
|----------------|------------|------------|------------|------------|----------------|-------------|-----------------|-------------|----------------|-------------|--------------|-------------|------------|------------|
| | WQ site | WQ site | WQ site | WQ site | WQ site | WQ site | WQ site | WQ site | WQ site | WQ site | WQ site | WQ site | | |
| 579 & 578 | 579 | 578 | 579 | 578 | 579 | 578 | 579 | 578 | 579 | 578 | 579 | 578 | 579 | 578 |
| 8/3/94 | 2.9 | 5.2 | 5.1 | 4.1 | 24 | 23 | 17 | 6 | 0.01 | 0.01 | 0.12 | 0.08 | 0.35 | 0.61 |
| 10/5/94 | 4 | 5.2 | 5 | 4.2 | 17 | 17 | 28 | 7 | 0.01 | 0.01 | 0.11 | 0.04 | 0.01 | 0.25 |
| 8/12/99 | 4.7 | 5.9 | 2.4 | 1.9 | 28 | 27 | 25 | 30 | 0.19 | 1.56 | 0.11 | 0.175 | 4.7 | 2.2 |
| 10/14/99 | 4.35 | 6.2 | 5.4 | 2.8 | 15 | 16 | 14.5 | 9.3 | 0.07 | 0.2 | 0.12 | 0.12 | 3 | 0.7 |
| 11/9/99 | 0.9 | 5.3 | 7.1 | 2.8 | 14 | 14 | 12 | 7.3 | 0.07 | 0.08 | 0.32 | 0.17 | 2.9 | 6.3 |
| Average | 3.4 | 5.6 | 5.0 | 3.1 | 19.6 | 19.4 | 19.3 | 11.9 | 0.07 | 0.37 | 0.16 | 0.12 | 2.2 | 2.0 |

Table 2b

| COL DATE | DO (mg/L) | | BOD (mg/L) | | TEMP Degrees C | | TURBIDITY (FTU) | | NITRATE (mg/L) | | TPHOS (mg/L) | | Flow (cfs) | Flow (cfs) |
|----------------|------------|------------|------------|------------|----------------|-----------|-----------------|-----------|----------------|-------------|--------------|-------------|------------|------------|
| | WQ site | WQ site | WQ site | WQ site | WQ site | WQ site | WQ site | WQ site | WQ site | WQ site | WQ site | WQ site | | |
| 579 & 578 | 579 | 578 | 579 | 578 | 579 | 578 | 579 | 578 | 579 | 578 | 579 | 578 | 579 | 578 |
| 6/10/98 | 4.9 | 3.9 | 1.0 | 1.0 | 23 | 20 | 14 | 8 | 0.28 | 0.28 | 0.11 | 0.09 | 8.6 | 2.1 |
| 10/5/94 | 4.5 | 2.9 | 1.0 | 1.0 | 24 | 24 | 32 | 13 | 0.09 | 0.33 | 0.16 | 0.09 | 6.2 | 0.4 |
| Average | 4.7 | 3.4 | 1.0 | 1.0 | 24 | 22 | 23 | 11 | 0.19 | 0.31 | 0.16 | 0.09 | 7.4 | 1.3 |

Desired Endpoints of Water Quality at Site 579 over 2005 - 2009

The desired endpoint will be reduced biochemical oxygen demand from artificial sources such that average BOD concentrations remain below 3.1 mg/l in the stream under the critical flow conditions which results in no excursions below 5 mg/l of DO detected between 2005 - 2009 attributed to these sources.

This desired endpoint should improve DO concentrations in the creek at the critical lower flows

(0 - 8.6 cfs) in the warmer months of the year (June-November). Seasonal variation is accounted for by this TMDL, since the TMDL endpoint is sensitive to the low flow and/or higher temperature conditions, generally occurring in the specified months.

This endpoint will be reached as a result of expected, though unspecified, reductions in organic 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 this endpoint will provide full support of the aquatic life function of the creek and attain the dissolved oxygen water quality standard.

3. SOURCE INVENTORY AND ASSESSMENT

NPDES: There are three NPDES permitted wastewater dischargers within the watershed. These systems are outlined in Table 3. The city of Reading, although located within the watershed, discharges to Melvern Lake which is located downstream of water quality monitoring site 579 and therefore, cannot contribute to the impairment listed at the monitoring site (**Figure 4**).

Table 3

| DISCHARGING FACILITY | STREAM REACH | SEGMENT | DESIGN FLOW | TYPE |
|----------------------|---|---------|-------------|--------|
| Admire MWTP | One Hundred and Forty Two Mile Creek via Hill Creek | 71 | 0.024 mgd | Lagoon |
| Allen MWTF | Hill Creek via unnamed tributary | 71 | 0.025 mgd | Lagoon |
| Reading MWTF | Melvorn Res. via unnamed tributary | - | 0.040 mgd | Lagoon |

Population projections for Admire, Allen and Reading to the year 2020 indicate little to no growth (0 - 5% increase). Projections of future water use and resulting wastewater appear to be within design flows for all point sources. Since 1997, the City of Allen’s quarterly effluent monitoring indicates BOD concentrations have exceeded permit limits only once for samples taken during the identified critical period (June - November). During the same period, the City of Admire’s monthly effluent monitoring indicates BOD concentrations have exceeded permit limits more than 25% of the time for the critical period (June - November).

Livestock Waste Management Systems: Nine operations are registered, certified or permitted within the watershed. These facilities are either beef, swine or dairy. About half of these facilities are located within 1 mile of the main stem or listed tributaries upstream of site 579. Potential animal units for all facilities in the watershed total 2,665. The actual number of animal units on site is variable, but typically less than potential numbers (**Figure 4**).

Hundred and Forty Two Mile Creek/Marais des Cygnes River Watershed NPDES Sites and Livestock Waste Management Facilities

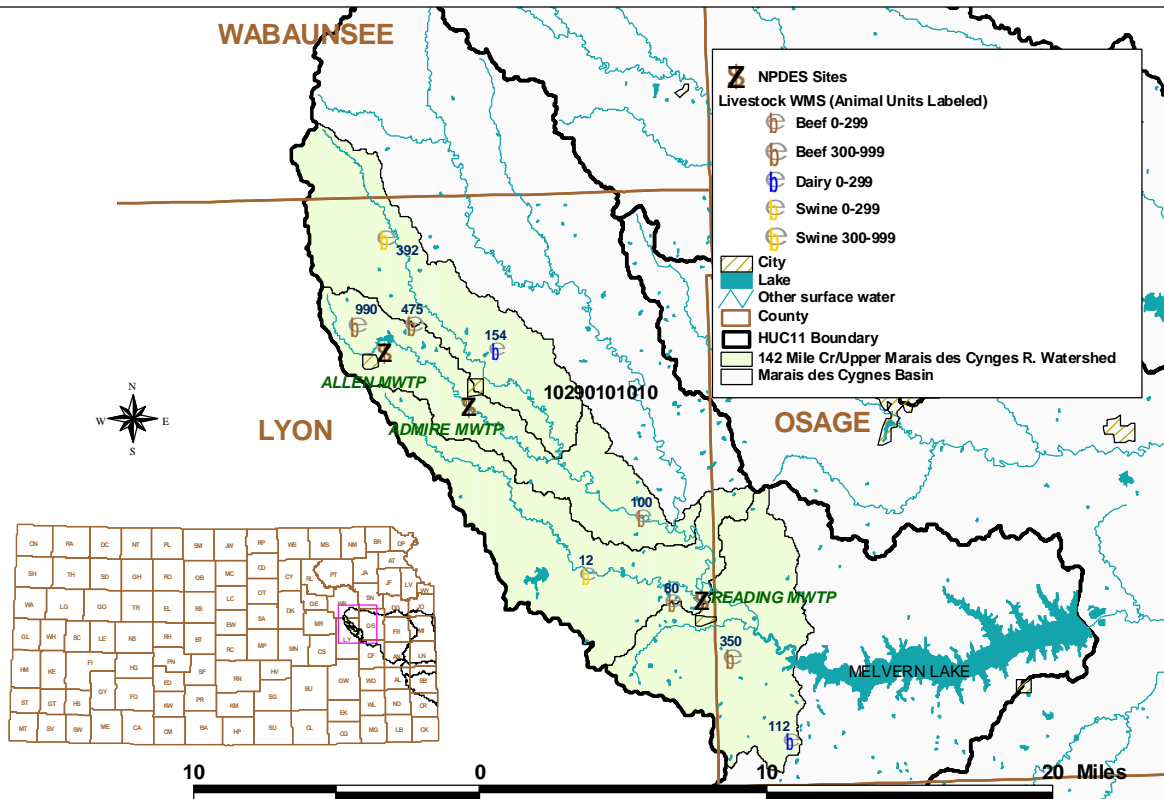


Figure 4

Land Use: Most of the watershed is grassland (77% of the area), cropland (19%), woodland (3%). Most of the grassland is located in the upper two thirds and around the perimeter (higher elevations) of the watershed. Based on 1998 water use reports, none of the cropland in the watershed is irrigated. The grazing density estimate is average for the Marais des Cygnes and Missouri Basins (32-36 animal units/mi²) (**Figure 5**).

On-Site Waste Systems: The watershed's population density is low (5 - 7 persons/mi²) when compared to the averages across the Marais des Cygnes and Missouri Basins. The rural population projections for Osage County through 2020 show significant growth (64% increase). The rural population projections for Lyon and Wabaunsee County show slight declines (<10% decrease).

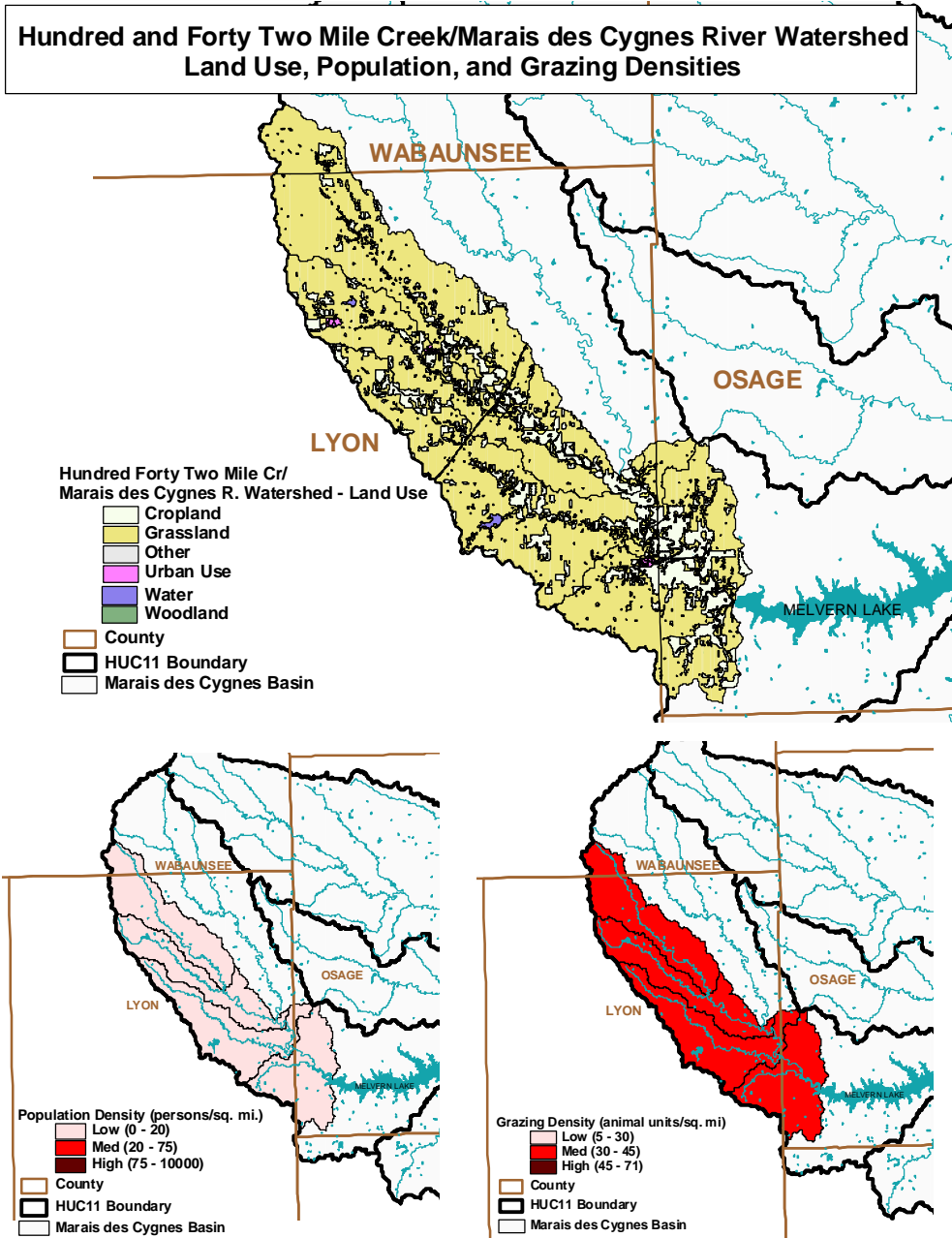


Figure 5

Contributing Runoff: The watershed’s average soil permeability is 0.4 inches/hour according to NRCS STATSGO data base. About 99.6% of the watershed produces runoff even under relative low (1.71"/hr) potential runoff conditions. Under very low (1.14"/hr) potential conditions, this potential contributing area is slightly reduced (91.1%). 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 0.57"/hr of rain will still generate runoff from 79.3% of this watershed.

Background Levels: Some organic enrichment may be associated with environmental background levels, including contributions from wildlife and stream side vegetation, but it is likely that the density of animals such as deer is fairly dispersed across the watershed and that the loading of oxygen demanding material is constant along the stream. In the case of wildlife, this loading should result in minimal organic loading to the streams below the levels necessary to violate the water quality standards. In the case of stream side vegetation, based on the fairly even distribution of woodland along the main stem and tributary segments, the loading should be relatively constant along the stream.

4. ALLOCATION OF POLLUTION REDUCTION RESPONSIBILITY

It is presumed that reductions in BOD loads will reduce DO excursions under certain critical flow conditions. Therefore, any allocation of wasteloads and loads will be made in terms of BOD reductions. Yet, because DO is a manifestation of multiple factors, the initial pollution load reduction responsibility will be to decrease the BOD over the critical range of flows encountered on the One Hundred Forty Two Mile Creek/Marais des Cygnes River system. These reductions have been based on the relationship between DO and BOD for the samples taken at Water Quality Monitoring site 579 as compared to the relatively unimpaired Salt Creek watershed and its water quality monitoring site 578. Allocations relate to the BOD levels seen in One Hundred Forty Two Mile Creek/Marais des Cygnes River system at site 579 relative to site 578 for the critical lower flow conditions (0-8.6 cfs). Based on this relationship, BOD loads at site 579 needs to be reduced by 38% (so that in stream average BOD is 3.1 mg/L or less). Additional monitoring over time will be needed to further ascertain the relationship between BOD reductions of non-point sources, flow conditions, water temperatures and DO levels along the stream.

For this phase of the TMDL the average condition is considered across the seasons to establish goals of the endpoint and desired reductions. Therefore, the target average BOD level was multiplied by the average daily flow for the Marais des Cygnes River across all hydrologic conditions. This is represented graphically by the integrated area under the BOD load duration curve established by this TMDL. The area is segregated into allocated areas assigned to point sources (WLA) and nonpoint sources (LA). Future growth in wasteloads should be offset by reductions in the loads contributed by nonpoint sources. This offset along with appropriate limitations should eliminate the impairment. This TMDL represents the “Best Professional Judgment” as to the expected relationship between physical factors, organic matter and DO.

Point Sources: Point sources are responsible for maintaining their systems in proper working condition and appropriate capacity to handle anticipated wasteloads of their respective populations. The State and NPDES permits will continue to be issued on 5 year intervals, with inspection and monitoring requirements and conditional limits on the quality of effluent released from these facilities. Ongoing inspections and monitoring of the systems will be made to ensure that minimal contributions have been made by this source.

Based upon the preceding assessment, only those point sources (Admire and Allen) contributing a BOD load in the One Hundred Forty Two Mile Creek/Marais des Cygnes River Watershed

upstream of site 579 will be considered in this Wasteload Allocation. Streeter-Phelps analysis indicates the present BOD permit limit for each point source maintains DO levels above 5 mg/L for flows greater than or equal to the 7Q10 of 1 cfs and, until additional in stream monitoring can further define the DO/BOD relationship, is therefore assumed to correspond to maintaining an average of BOD of less than 3.1 mg/L at the sampling site across this flow condition and achieves the Kansas Water Quality Standard for DO of 5 mg/L.

By K.A.R. 28-16-28c(c)(1) for flows less than 1 cfs, classified streams may be excluded from the application of some or all of the requirements of K.A.R. 28-16-28e(c). The sum of the design flows of the point sources (0.076 cfs) redefines the lowest flow seen at site 579 (94-99% exceedence), and the WLA equals the TMDL curve across this flow condition (**Figure 6**).

From this, the WLA for the city of Allen defined at sample site 579 is 0.65 lbs/day BOD and the WLA for the city of Admire is 0.62 lbs/day across all flow conditions (**Figure 6**).

The city of Admire is under a schedule of compliance to upgrade its waste treatment facility (adding an additional cell to its current 2 cell lagoon system) by November 1, 2000. This upgrade should address its historical BOD permit limit violations.

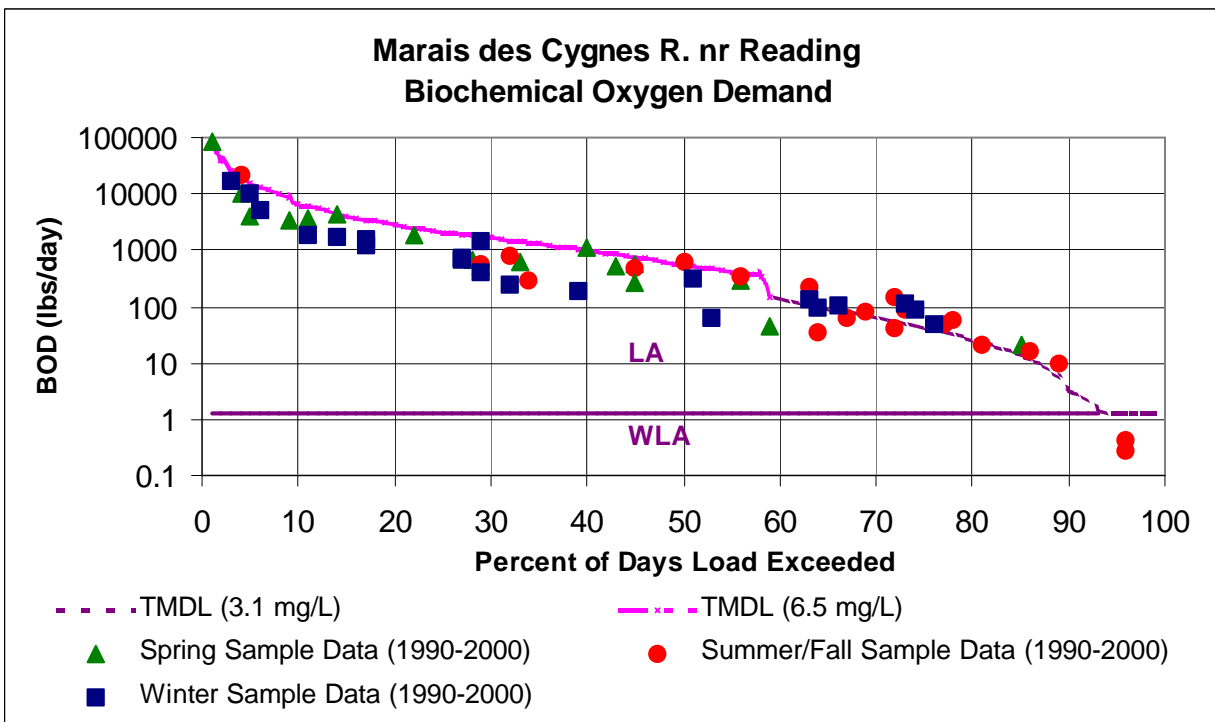


Figure 6

Non-Point Sources: Based on the prior assessment of sources, the distribution of excursions from water quality standards at site 579 and the relationship of those excursions to runoff conditions and seasons, non-point sources are also seen as a contributing factor to the occasional DO excursions in the watershed.

The samples from the One Hundred Forty Two Mile Creek/Marais des Cygnes River watershed show there were no DO violations at flows in excess of 8.6 cfs. The Load Allocation assigns responsibility for reducing the in stream BOD levels at site 579 to 3.1 mg/L across the 0.076 - 8.6 cfs range of the critical flow condition (59 - 93% exceedence) and maintaining the in stream BOD levels at site 579 to the historical levels of 6.5 mg/L for flows in excess of 8.6 cfs (which is 90th percentile of BOD samples for flows in the Upper Marais des Cygnes River above 8.6 cfs near Reading). The LA equals zero for flows from 0 - 0.076 cfs (94 - 99% exceedence), since the flow at this condition is entirely effluent created, and then increases to the TMDL curve with increasing flow beyond 0.076 cfs (**Figure 6**). Sediment control practices such as buffer strips and grassed waterways should help reduce the non-point source BOD load under higher flows as well as reduce the oxygen demand exerted by the sediment transported to the stream that may occur during the critical flow period.

To address the DO violations outlined in Table 2b at water quality sampling site 579, riparian vegetation restoration should occur adjacent to One Hundred Forty Two Mile Creek and Hill Creek to provide shade for the stream and generally reduce surface water temperatures during the seasons of concern.

Defined Margin of Safety: The Margin of Safety will be implied based on conservative assumptions used in the permitting of the point source discharges including coincidence of low flow with maximum discharge from the treatment plant, associated CBOD content and temperature of the effluent, and the better than permitted performance of the treatment plant in producing effluent with BOD well below permit limits under critical seasonal conditions.

State Water Plan Implementation Priority: Because this watershed has indicated some problem with dissolved oxygen which has short term and immediate consequences for aquatic life, this TMDL will be a High Priority for implementation.

Unified Watershed Assessment Priority Ranking: This watershed lies within the Upper Marais des Cygnes River Subbasin (HUC 8: 10290101) with a priority ranking of 5 (High Priority for restoration work).

Priority HUC 11s and Stream Segments: Because of the location of the water quality sampling site in the watershed, priority should be directed toward baseflow generating and conducting stream segments; One Hundred Forty Two Mile Creek (segment 40) and Hill Creek (segment 71) of HUC14s 030 and 040 in HUC11 10290101010 upstream of water quality sampling site 579.

5. IMPLEMENTATION

Desired Implementation Activities

1. Where needed, restore riparian vegetation along target stream segments.
2. Install grass buffer strips where needed along streams.
3. Renew state and federal permits and inspect permitted facilities for permit compliance
4. Install proper manure and livestock waste storage.

5. Insure proper on-site waste system operations in proximity to targeted streams.
6. Insure that labeled application rates of chemical fertilizers are being followed.

Implementation Programs Guidance

NPDES and State Permits - KDHE

- a. Municipal permits for facilities in the watershed will be renewed after 2004 with continuation of DO and BOD monitoring and permit limits preventing excursions in these criteria.
- b. Livestock permitted facilities will be inspected for integrity of applied pollution prevention technologies.
- c. Registered livestock facilities with less than 300 animal units will apply pollution prevention technologies.
- d. Manure management plans will be implemented.

Non-Point Source Pollution Technical Assistance - KDHE

- a. Support Section 319 demonstration projects for pollution reduction from livestock operations in watershed.
- b. Provide technical assistance on practices geared to small livestock operations which minimize impact to stream resources.
- c. Provide technical assistance in urban and agricultural setting on practices geared to minimize chemical fertilizer impact to stream resources.
- d. Guide federal programs such as the Environmental Quality Improvement Program, which are dedicated to priority subbasins through the Unified Watershed Assessment, to priority watersheds and stream segments within those subbasins identified by this TMDL.

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

- a. Provide alternative water supplies to small livestock operations
- b. Develop improved grazing management plans
- c. Reduce grazing density on overstocked pasturelands
- d. Install livestock waste management systems for manure storage
- e. Implement manure management plans
- f. Install replacement on-site waste systems
- g. Coordinate with USDA/NRCS Environmental Quality Improvement Program in providing educational, technical and financial assistance to agricultural producers.

Riparian Protection Program - SCC

- a. Develop riparian restoration projects along targeted stream segments, especially those areas with baseflow.
- b. Design winter feeding areas away from streams.

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 livestock producers on riparian and waste management techniques.
- b. Educate chemical fertilizer users on proper application rates and timing.
- c. Provide technical assistance on livestock waste management design.
- d. Continue Section 319 demonstration projects on livestock management.

Agricultural Outreach - KDA

- a. Provide information on livestock management to commodity advocacy groups.
- b. Support Kansas State outreach efforts.

Local Environmental Protection Program - KDHE

- a. Inspect on-site waste systems within one mile of priority stream segments (40 and 71).

Timeframe for Implementation: Pollution reduction practices should be installed along the One Hundred Forty Two Mile Creek and Hill Creek within the priority subwatersheds over the years 2002-2006, with follow up implementation thereafter.

Targeted Participants: Primary participants for implementation will be the identified point sources and landowners immediately adjacent to the priority stream segments. Implemented activities should be targeted to those stream segments with greatest potential contribution to baseflow. Nominally, this would be most likely be:

1. Areas of denuded riparian vegetation along One Hundred Forty Two Mile Creek, Hill Creek and their contributing tributaries.
2. Facilities without water quality controls
3. Unbuffered cropland adjacent to stream
4. Sites where drainage runs through or adjacent livestock areas
5. Sites where livestock have full access to stream and stream is primary water supply
6. Poor riparian sites
7. Sites which have an urban runoff component
8. Failing on-site waste systems

Some inventory of local needs should be conducted in 2002 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 2006: The year 2006 marks the mid-point of the ten year implementation window for the watershed. At that point in time, milestones should be reached which will have at least two-thirds of the landowners responsible for riparian restoration or buffer strips, cited in the local

assessment, participating in the implementation programs provided by the state. Additionally, sampled data from site 579 should indicate evidence of improved dissolved oxygen levels at the critical flow conditions relative to the conditions seen over 1990-2000. At this early stage of implementation it is recognized that in the case of the establishment of riparian vegetation, it may take 20 years and beyond to provide a shade canopy over the stream.

Delivery Agents: The primary delivery agents for program participation will be the 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 County staff managing. On-site waste system inspections will be performed by Local Environmental Protection Program personnel for Osage, Lyon and Wabaunsee counties.

Reasonable Assurances:

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

1. K.S.A. 65-164 and 165 empowers the Secretary of KDHE to regulate the discharge of sewage into the waters of the state.
2. 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.
3. K.A.R. 28-16-69 to -71 implements water quality protection by KDHE through the establishment and administration of critical water quality management areas on a watershed basis.
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 non-point 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*.
8. The *Kansas Water Plan* and the Marais des Cygnes 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 pollution 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 TMDL is a High Priority consideration.

Effectiveness: Riparian restoration projects are being touted as a significant means for water temperature buffers of streams. Non-point source controls for livestock waste have been shown to be effective in reducing pollution in locales such as the Herrington Lake watershed. The key to effectiveness is participation within a finite subwatershed to direct resources to the activities influencing water quality. 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 over 1990-2000, the state may employ more stringent conditions on agricultural producers and urban runoff in the watershed in order to meet the desired endpoints expressed in this TMDL. The state has the authority to impose conditions on activities with a significant potential to pollute the waters of the state under K.S.A. 65-171. If overall water quality conditions in the watershed deteriorate, a Critical Water Quality Management Area may be proposed for the watershed, in response.

6. MONITORING

KDHE will continue to collect bimonthly samples at Station 579 including dissolved oxygen samples. Should impaired status remain, the desired endpoints under this TMDL will be refined and more intensive sampling will need to be conducted under specified seasonal flow conditions over the period 2005-2009.

Monitoring of BOD levels in effluent will continue to be a condition of NPDES and state permits for facilities. This monitoring will continually assess the functionality of the systems in reducing organic levels in the effluent released to the streams.

Local program management needs to identify its targeted participants of state assistance programs for implementing this TMDL. This information should be collected in 2002 in order to support appropriate implementation projects.

7. FEEDBACK

Public Meeting: The public meeting to discuss TMDLs in the Marais des Cygnes Basin was held February 28, 2001 in Ottawa. 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 Marais des Cygnes Basin.

Public Hearings: Public Hearings on the TMDLs of the Marais des Cygnes Basin were held in Fort Scott on May 30 and Ottawa on May 31, 2001.

Basin Advisory Committee: The Marais des Cygnes Basin Advisory Committee met to discuss the TMDLs in the basin on October 4, 2000, February 28 and May 30, 2001.

Milestone Evaluation: In 2006, evaluation will be made as to the degree of implementation which has occurred within the watershed and current condition of One Hundred Forty Two Mile Creek/Upper Marais des Cygnes River watershed. Subsequent decisions will be made regarding the implementation approach and follow up of additional implementation in the watershed.

Consideration for 303(d) Delisting: The One Hundred Forty Two Mile Creek/Upper Marais des Cygnes River watershed will be evaluated for delisting under Section 303(d), based on the monitoring data over the period 2005-2009. Therefore, the decision for delisting will come about in the preparation of the 2010 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 2002 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 2002-2006.