

MARAIS DES CYGNES BASIN TOTAL MAXIMUM DAILY LOAD

Waterbody: Ottawa Creek (Tauy Creek)
Water Quality Impairment: Dissolved Oxygen

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasin: Upper Marais Des Cygnes **County:** Franklin and Douglas

HUC 8: 10290101

HUC 11 (HUC 14s): **050** (050, 060, 070, 080 and 090)
 060 (010, 020, 030 and 040)

Drainage Area: 133 square miles

Main Stem Segments: WQLS: 11; starting at confluence with Marais des Cygnes River and traveling upstream to confluence with Walnut Creek (**Figure 1**).

*1998 303(d) list identifies this WQLS correctly, but stream name of Tauy Creek is incorrect for this portion of segment. Correct stream name is Ottawa Creek (as in **Figure 1**).*

Tributary Segment: WQLS: Tauy Creek (11) upstream of confluence with Walnut Creek
 WQLS: W. Fork Tauy Creek (11)
 WQLS: E. Fork Tauy Creek (85)
 WQLS: Walnut Creek (90)

Designated Uses: Special Aquatic Life Support, Secondary Contact Recreation and Food Procurement on Main Stem Segment and W. Fork Tauy Creek.

Expected Aquatic Life Support, Secondary Contact Recreation, and Food Procurement for Walnut Creek. Expected Aquatic Life Support, Secondary Contact Recreation, Domestic Water Supply; Food Procurement; Ground Water Recharge; Industrial Water Supply Use; Irrigation Use; Livestock Watering Use for E. Fork Tauy Creek.

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

Impaired Use: 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 616 near Ottawa

Period of Record Used: 1993, 1997, 1999 and 2000 for Station 616 (**Figure 2**)

Flow Record: Tauy Creek near Ottawa (USGS Gaging Site 06913650); 1970-1999; Salt Creek near Lyndon (USGS Station 06911500)

Long Term Flow Conditions: 10% Exceedence Flows = 103 cfs, 7Q10 = 1 cfs

Ottawa (Tauy) Creek Watershed Dissolved Oxygen TMDL HUC and Stream Segments

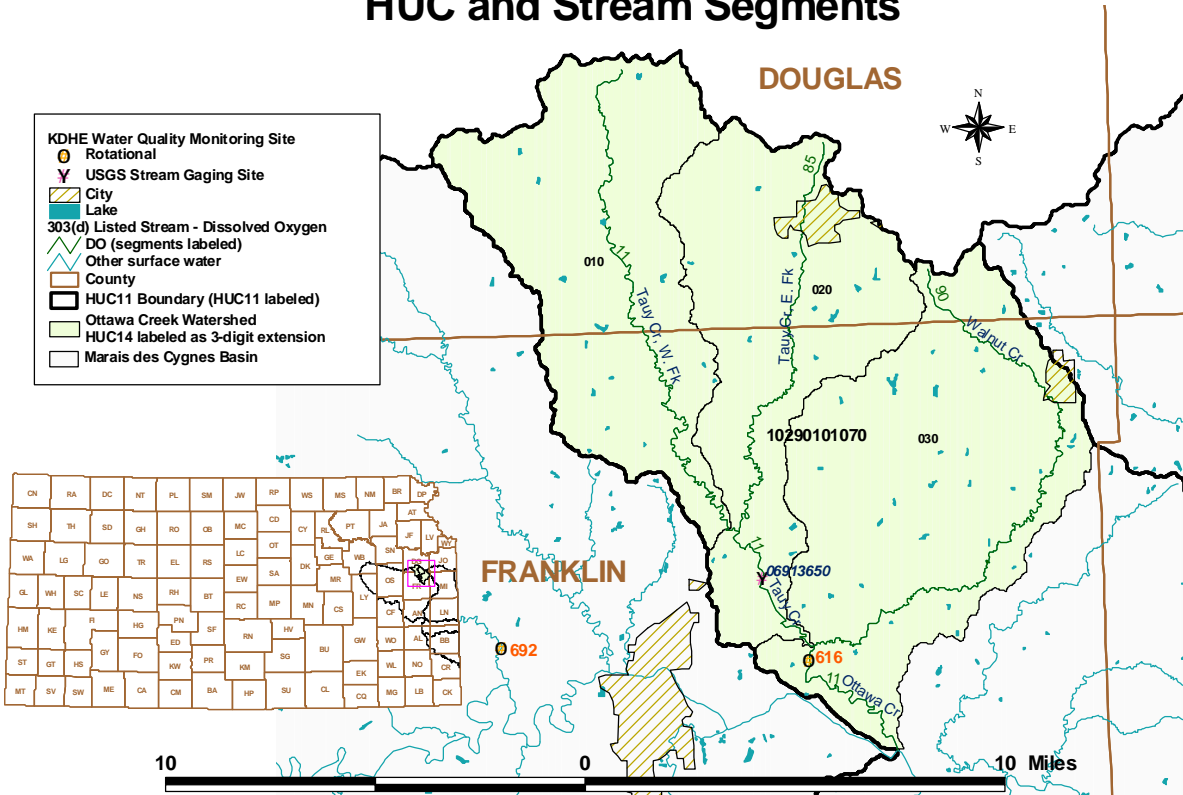


Figure 1

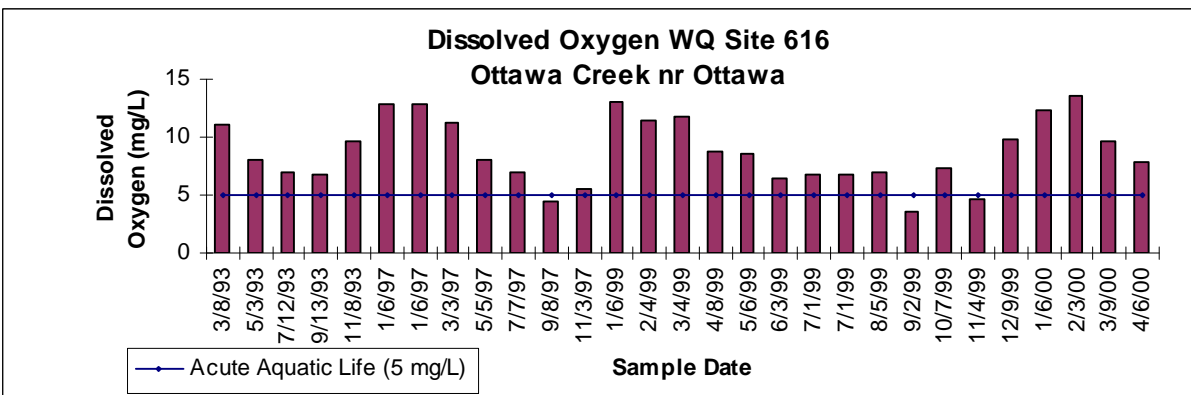


Figure 2

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 Ottawa Creek 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**).

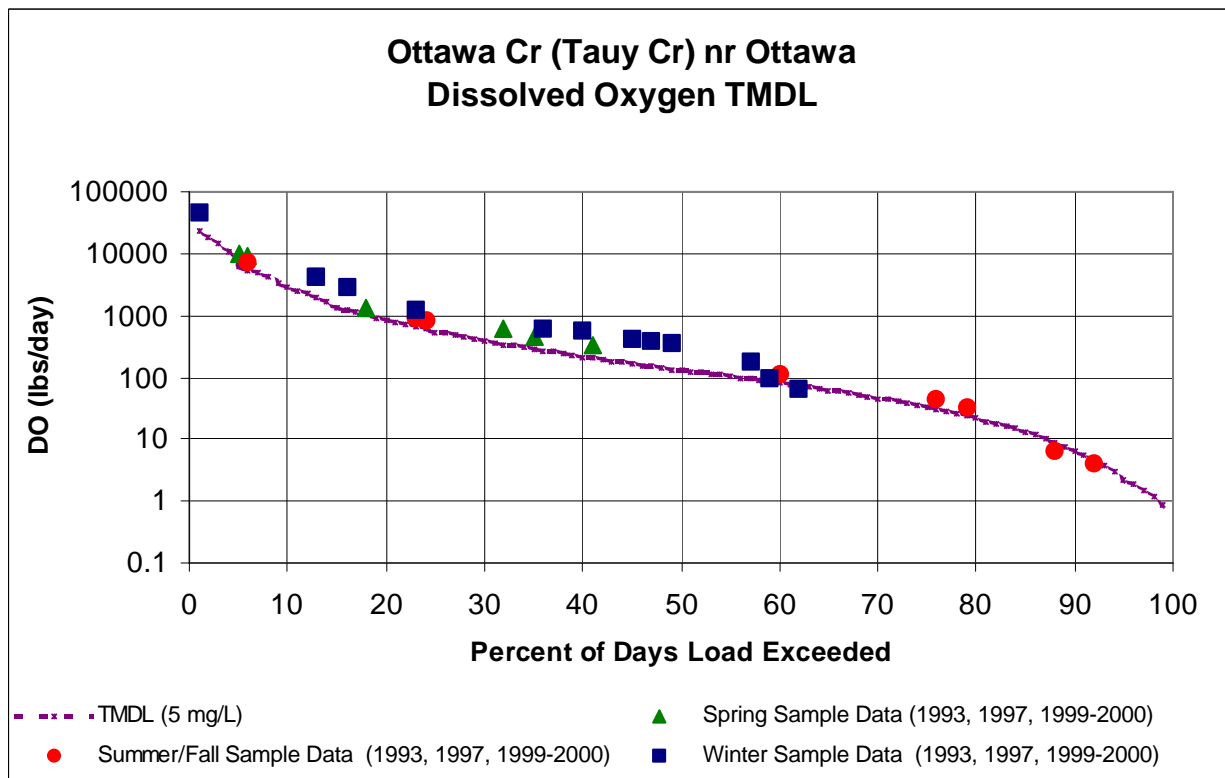


Figure 3

Excursions were seen in the Summer-Fall and Winter seasons and are outlined in Table 1. Twenty five percent of the Summer-Fall samples and 8% of Winter samples were below the aquatic life criterion. None of Spring samples were under the aquatic life criterion. Overall, 11% of the samples were under the criterion. This would represent a baseline condition of partial-support of the impaired designated use.

No DO violations have been encountered at flows exceeding 3 cfs on Ottawa Creek near Ottawa, therefore a critical low flow can be identified on Ottawa Creek as those flows of 3 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.
Ottawa Creek near Ottawa (616)	Spring	0	0	0	0	0	0	0/6 = 0%
	Summer	0	0	0	0	1	1	2/8 = 25%
	Winter	0	0	0	1	0	0	1/13 = 8%

A watershed comparison approach was taken in developing this TMDL. The Appanoose Creek watershed (Water Quality Sampling Site 692 in the watershed was not impaired by low DO) has similar land use characteristics and is located near the Ottawa Creek watershed. The relationship of DO to Biochemical Oxygen Demand (BOD), water temperature, turbidity, nitrate, phosphorus and stream flow were used in the comparisons.

Table 2 outlines those water quality data for the samples taken on the same date for the two sites of interest between 1999 and 2000 when DO was below the aquatic life criterion for sample site 616.

At sampling site 616 the average BOD, nitrate, phosphorus, temperature, turbidity were much the same as that of sampling site 692. This indicates that low flow and high water temperature can be considered a factor driving the occasional DO excursion. Physically, the Appanoose watershed has a fairly steep narrow alluvial valley along the main stem while the Ottawa Creek watershed has a larger alluvial valley and a gentle gradient toward the main stem. This physical difference between these watersheds and its effect on aeration in the stream through tributary inputs is likely the primary cause in the difference in DO levels between the two watersheds under the critical conditions of lower flow and higher stream temperatures.

Table 2

COL DATE	DO (mg/L)		BOD (mg/L)		TEMP Degrees C		TURBIDITY (FTU)		NITRATE (mg/L)		TPHOS (mg/L)		Flow (cfs)
	WQ site	WQ site	WQ site	WQ site	WQ site	WQ site	WQ site	WQ site	WQ site	WQ site	WQ site		
616 & 692	616	692	616	692	616	692	616	692	616	692	616	692	616
9/2/99	3.6	6.2	1.0	1.0	25	25	11	21	0.15	0.07	0.1	0.09	0.26
11/4/99	4.6	6.3	2.52	2.46	10	8	5.1	4.8	0.01	0.01	0.17	0.2	2.7
Average	4.1	6.25	1.76	1.73	17.5	16.5	8.05	12.9	0.08	0.04	0.14	0.15	1.5

Desired Endpoints of Water Quality at Site 616 over 2005 - 2009

The ultimate endpoint for this TMDL will be to achieve the Kansas Water Quality Standard of 5 mg/l to fully support Aquatic Life.

Seasonal variation is accounted for by this TMDL, since the TMDL endpoint is sensitive to the low flow conditions, generally occurring in the Summer and Fall seasons.

This endpoint will be reached as a result of expected, though unspecified, improvements in tributary buffer strip conditions which will filter sediment before reaching the stream. Improvements to buffer strip conditions will result 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.

Since BOD is not considered a factor in the occasional DO excursion at this site, the BOD target will be to maintain the historical average in stream BOD of 3.1 mg/L or less at the sampling site.

3. SOURCE INVENTORY AND ASSESSMENT

NPDES: There are two NPDES permitted wastewater dischargers within the watershed (**Figure 4**). These systems are outlined in Table 3.

Table 3

DISCHARGING FACILITY	STREAM REACH	SEGMENT	DESIGN FLOW	TYPE
Baldwin City MWTF	E. Fork Tauy Cr.	85	0.43 mgd	Mech.
Wellsville MWTF	Walnut Cr.	90	0.176 mgd	Lagoon

The population projection for Baldwin City to the year 2020 indicates significant growth. The projection for Wellsville indicates modest growth. Projections of future water use and resulting wastewater appear to be within the design flows for of the current system's treatment capacity. Examination of September 1999 to November 2000 effluent monitoring of Baldwin City indicates that BOD discharges are well within permit limits. Wellsville effluent monitoring indicates BOD discharges in excess of permit limits are rare during the identified critical flow period (September - November).

Livestock Waste Management Systems: Sixteen operations are registered, certified or permitted within the watershed. Facility types are primarily dairy or swine. These facilities are mainly located near the watersheds' main stem or primary tributaries (**Figure 4**). Potential animal units for all facilities in the watershed total 1,718. The actual number of animal units on site is variable, but typically less than potential numbers.

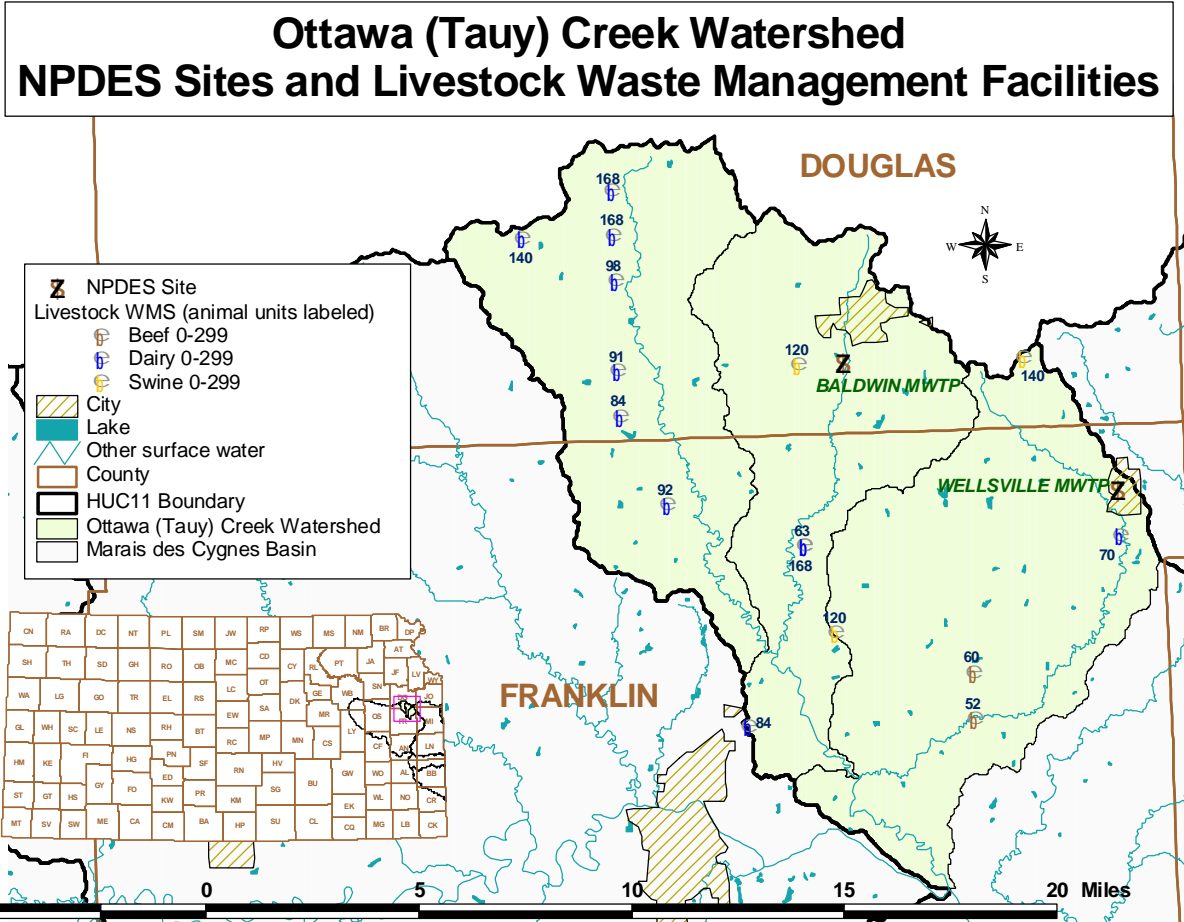


Figure 4

Land Use: Most of the watershed is cropland (50% of the area), grassland (38%), woodland (9%) or urban use (1%). Most of the cropland is located in the lower half of the watershed. The grazing density estimate is average when compared to densities in the Marais des Cygnes and Missouri Basins (33-39 animal units/mi²) (**Figure 5**).

On-Site Waste Systems: The watershed’s population density is average to high (20-98 person/mi²) when compared to densities for the Marais des Cygnes and Missouri Basins, with the higher densities associated with the area surrounding Baldwin City (**Figure 5**). The rural population projections for Franklin and Douglas County through 2020 show substantial growth (40-90% increase, respectively).

Ottawa (Tauey) Creek Watershed Land Use, Population and Grazing Density

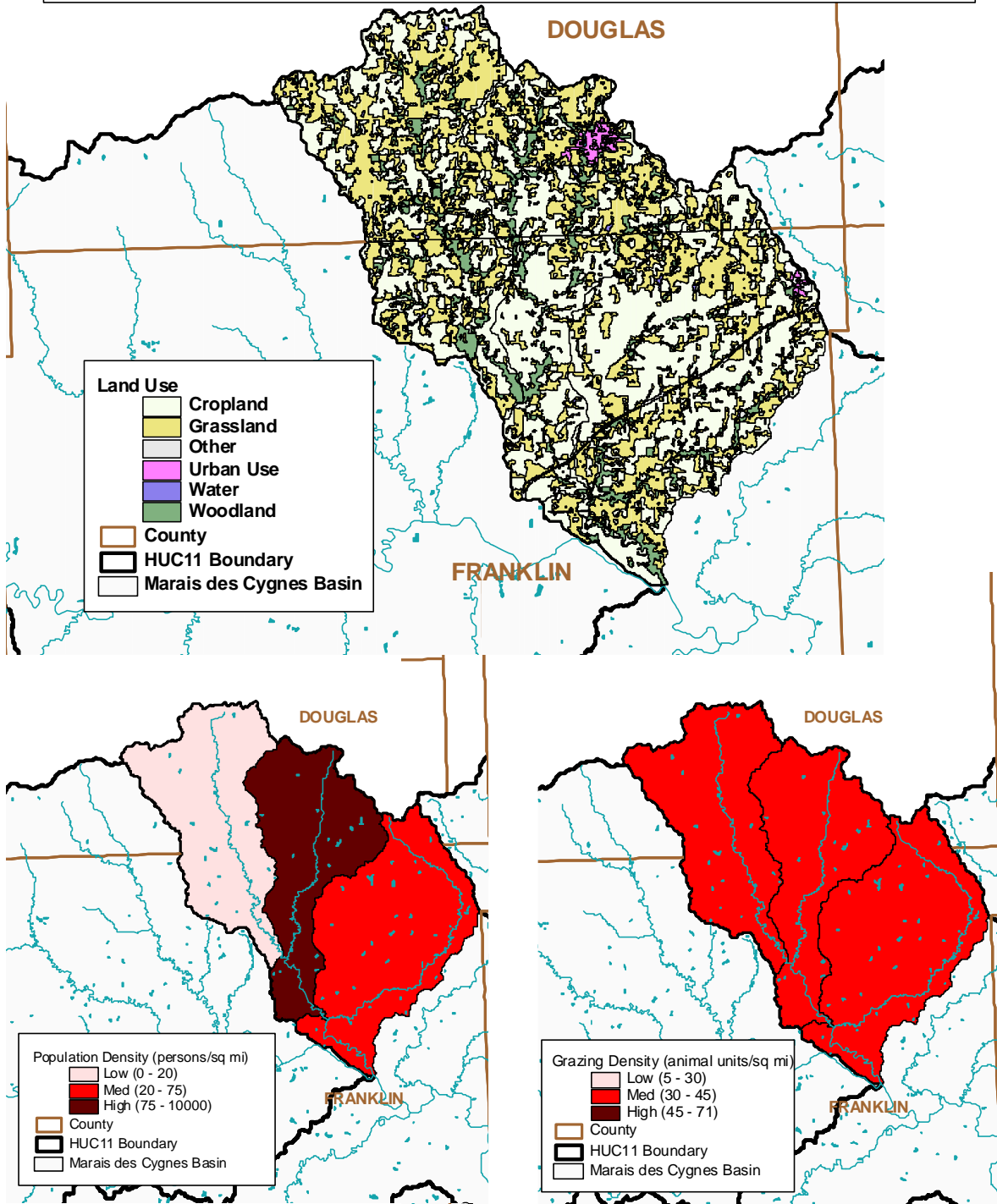


Figure 5

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 loading to the streams below the levels necessary to violate the water quality standards. In the case of stream side vegetation, the loading should be greater toward the upper half of the watershed with its larger proportion of woodland near the stream.

4. ALLOCATION OF POLLUTION REDUCTION RESPONSIBILITY

This is a phased TMDL. Additional monitoring over time will be needed to further ascertain the relationship between improvements in tributary buffer strip conditions which should filter sediment before reaching the stream, reduce SOD and consequently improve DO levels during the critical periods of concern. In Phase One of this TMDL the following allocations apply:

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.

Because of the indications that low flow is the primary factor causing the occasional excursion from the water quality standard rather than BOD, point sources are not seen as a significant source of DO excursions. 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 the historical average BOD concentration of 3.1 mg/L or less at monitoring site 616 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 (0.94 cfs) redefines the lowest flow seen at site 616 (79 - 99% exceedence), and the WLA equals the TMDL curve across this flow condition (**Figure 6**).

From this, the WLA for the city of Baldwin City defined at sampling site 616 is 11.1 lbs/day BOD and the WLA for the city of Wellsville is 4.55 lbs/day BOD across all flow conditions (**Figure 6**).

The City of Wellsville is presently under a schedule of compliance to address its occasional BOD permit exceedences.

Non-Point Sources: Again, because the indications that low flow is the driving factor causing the occasional excursion from the water quality standard rather than BOD, non-point sources are

also not seen as a significant source of DO excursion in the watershed. The Load Allocation assigns responsibility for maintaining the historical average in-stream BOD levels at site 616 to 3.1 mg/L for flows greater than 1 cfs (0-78% exceedence). The LA equals zero for flows from 0 - 0.94 cfs (79 - 99 % exceedence), since the flow at this condition is entirely effluent created, and then increases to the TMDL curve with increasing flow beyond 0.94 cfs.(Figure 6).

To address the DO violations outlined in Table 2 at water quality sampling site 616, buffer strips should be installed on directly contributing tributaries to filter sediment before reaching the stream.

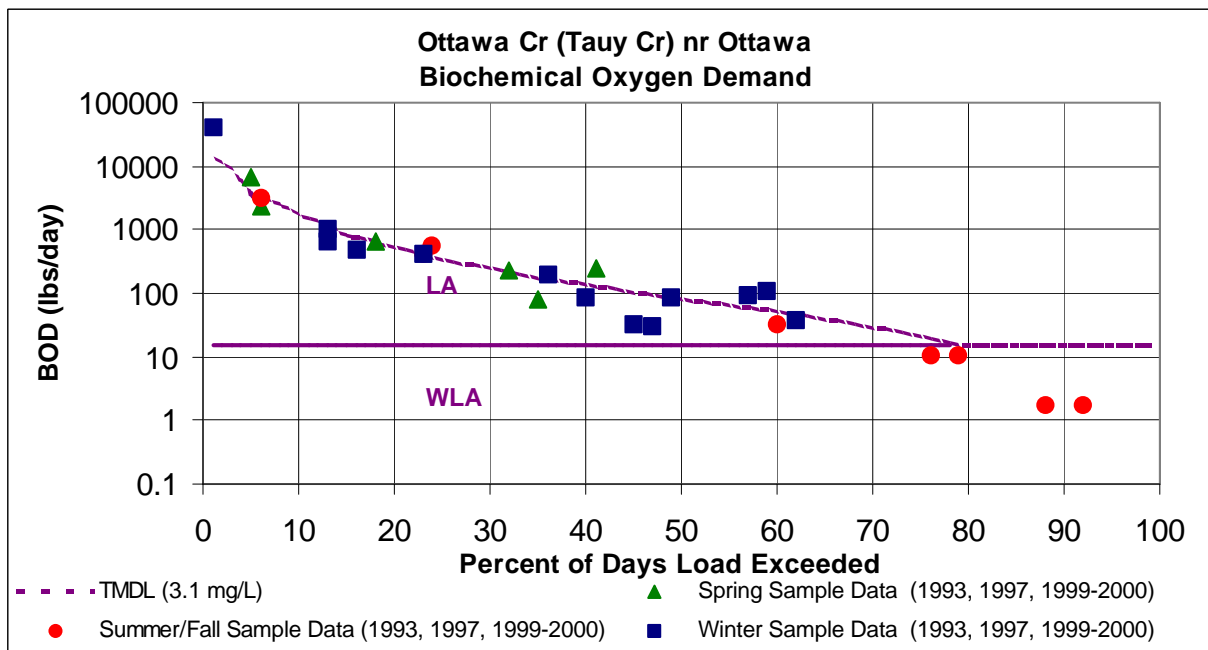


Figure 6

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 Basin (HUC 8: 10290101) with a priority ranking of 5 (High Priority for restoration work).

Priority HUC 11s and Stream Segments: Priority should be directed toward baseflow

generating and conducting stream segments; the main stem of Ottawa, Taury Creek, Segment 11 and listed tributary segments 11, 85 and 90.

5. IMPLEMENTATION

Desired Implementation Activities

1. Where needed, create/restore buffer strips along contributing tributaries.

Implementation Programs Guidance

Buffer Initiative Program - SCC

- a. Install grass buffer strips near streams.

Timeframe for Implementation: Buffer strips should be installed on directly contributing tributaries over the years 2002-2006.

Targeted Participants: Primary participants for implementation will be landowners immediately adjacent to the listed 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. Unbuffered cropland adjacent to contributing tributaries.

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 buffer strip restoration, cited in the local assessment, participating in the implementation programs provided by the state.

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.

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 areas where buffer strips may be needed.

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: Buffer strips are touted as a means to filter sediment before it reaches a stream. 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 should collect bimonthly samples at Station 616 in 2005 and 2009 in order to assess progress and success in implementing this TMDL in reaching its endpoint.

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 Ottawa and Tauy Creek. Subsequent decisions will be made regarding the implementation approach and follow up of additional implementation in the watershed.

Consideration for 303(d) Delisting: The creek 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.