

# LOWER ARKANSAS RIVER BASIN TOTAL MAXIMUM DAILY LOAD

**Water Body: Kingman County State Fishing Lake**  
**Water Quality Impairment: Aquatic Plants Bundled with pH and Dissolved Oxygen**

## 1. INTRODUCTION AND PROBLEM IDENTIFICATION

**Subbasin:** South Fork Ninnescah

**County:** Kingman

**HUC 8:** 11030015

**HUC 11 (HUC 14):** 030 (010)

**Drainage Area:** Approximately 4.0 square miles.

**Conservation Pool:** Area 139 acres, Maximum Depth = 2 meters

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

**1998 303d Listing:** Table 4 - Water Quality Limited Lakes

**Impaired Use:** Secondary Contact Recreation and Aquatic Life Support

**Water Quality Standard:** The introduction of plant nutrients into surface waters designated for primary or secondary contact recreational use shall be controlled to prevent the development of objectionable concentrations of algae or algal by-products or nuisance growths of submersed, floating, or emergent aquatic vegetation. (KAR 28-16-28e(c)(7)(A)).

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

pH less than 6.5 and greater than 8.5 (KAR 28-16-28e(c)(2)(C))

## 2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

**Monitoring Sites:** Station 010401 in Kingman County State Fishing Lake.

**Period of Record Used:** Three surveys during 1976 - 1997.

**Current Condition:** The Kingman County SFL is evolving into a wetland. There is an abundance of submersed aquatic vegetation such as water lilies, water naiads, and pond weed in the lake. With the large quantity of macrophyte beds, there is little open water.

The intense macrophyte productivity has lead to high pH levels. Between 1976 and 1979, the average pH (pH = 7.32) was within the acceptable range. By 1997, the pH had risen to an average of 9.57, ranging from 9.53 to 9.61. When the plants deplete the carbon dioxide in the lake, they uptake bicarbonate during photosynthesis. Hydroxide is produced; and the pH increases.

Decomposition of plant material has lowered the dissolved oxygen concentrations in the lake. The dissolved oxygen concentrations decreased with increased depth. (See below table). At the surface, the average concentration was 10.1 mg/L, a sufficient amount of dissolved oxygen for aquatic life support. However, near the bottom of the lake, the concentration is zero mg/L.

Kingman Co. SFL	Date	Depth (ft)	Dissolved Oxygen (mg/L)
010401	30-Jun-76	0	6.800
010401	30-Jun-76	1	5.500
010401	30-Jun-76	3	4.700
010401	30-Jun-76	4	3.700
010401	19-Aug-97	0	13.400
010401	19-Aug-97	1.64	10.100
010401	19-Aug-97	3.28	7.000
010401	19-Aug-97	4.92	0.000
010401	19-Aug-97	6.56	0.000

While all existing use impairments would be alleviated by controlling them, the aquatic plant community should be allowed to flourish. The aquatic plant management practices would not provide the partial control that is needed. Repeated herbicide spot-treatments are expensive and environmentally unsound. The addition of grass carp to consume the plants will lead to either no control or complete removal of the plants. If the aquatic plants are completely removed, then the lake may become a very productive system. The grass carp do this by eating the plants (which competed with the algae for nutrients) and converting the plant biomass into fertilizer (their digestive systems are very inefficient).

Phosphorus appears to be the primary limiting factor in the water column, but macrophyte influences also exert an influence on phytoplankton development. An annual phosphorus load of 168 pounds per year is necessary to correspond to the concentrations seen in the lake. Light is not a limiting factor.

**Interim Endpoints of Water Quality (Implied Load Capacity) at Kingman County SFL over 2005 - 2009:**

In order to stabilize macrophytic growth, the desired endpoint will be to have a phosphorus load at or below 168 pounds per year. Achievement of this endpoint should result dissolved oxygen concentrations greater than 5 mg/L and pH values between 6.5 and 8.5. Refined endpoints will be developed in 2005 to reflect additional sampling and artificial source assessment and confirmation of impaired status of lake.

### 3. SOURCE INVENTORY AND ASSESSMENT

**Land Use:** The watershed has a low to moderate potential for nonpoint source pollutants. Thirty-three percent of watershed is cropland, 48% grassland, and 13% woodland. The greatest impact on lake is agricultural production and animal grazing in the watershed. (The summer and winter grazing density are high).

**Contributing Runoff:** The watershed's average soil permeability is 3.0 inches/hour according to NRCS STATSGO data base. About 27% of the watershed produces runoff even under relative low (1.5"/hr) potential runoff conditions. Under very low (<1"/hr) potential conditions, this potential contributing area is almost halved (22%). 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 only 6% of this watershed, chiefly along the stream channels.

**Background Levels:** Wildlife waste increases the levels of phosphorus in the lake. A sizable wooded area is located around the lake; leaf litter may be adding to the nutrient load. Geological formations contain small amounts of phosphorus (up to 0.5% of total weight), and may contribute to phosphorus loads.

### 4. ALLOCATION OF POLLUTANT REDUCTION RESPONSIBILITY

More detailed assessment of sources and confirmation of the macrophyte impairment must be completed before detailed allocations can be made. The general inventory of sources within the drainage does provide some guidance as to areas of load reduction.

**Point Sources:** A current Wasteload Allocation of zero is established by this TMDL because of the lack of point sources in the watershed. Should future point sources be proposed in the watershed and discharge into the impaired segments, the current wasteload allocation will be revised by adjusting current load allocations to account for the presence and impact of these new point source dischargers.

**Nonpoint Sources:** Water quality violations are effected by nonpoint source pollutants, such as cropland and animal grazing. Background levels may be attributed to wildlife waste and leaf litter. Generally a Load Allocation of 150.7 pounds of phosphorus per year is necessary to reach the endpoint.

**Defined Margin of Safety:** The margin of safety provides some hedge against the uncertainty of variable annual phosphorus load endpoint. Therefore, the margin of safety will be 16.8 pounds per year of phosphorus taken from the load capacity to ensure that adequate load reduction occurs to meet the endpoint.

**State Water Plan Implementation Priority:** Because Kingman County SFL needs a more detailed assessment of the aquatic plant impairment, this TMDL will be a Medium Priority for implementation

**Unified Watershed Assessment Priority Ranking:** This watershed lies within the South Fork Ninnescah Subbasin (HUC 8: 11030015) with a priority ranking of 15 (High Priority for restoration work).

**Priority HUC 11s:** The entire watershed is within HUC 11 (030).

## 5. IMPLEMENTATION

### Desired Implementation Activities

Minimize anthropogenic oriented contributions of loading of plant nutrients to the lake.

### Implementation Programs Guidance

Until the 2005 assessment of the continuation of monitoring is made, no direction can be made to those implementation programs.

**Time Frame for Implementation:** Continued monitoring over the years from 2001 to 2005.

**Targeted Participants:** No targets until 2005 assessment.

**Milestone for 2005:** The year 2005 marks the midpoint of the ten-year implementation window for the watershed. At that point in time, milestones should be reached which will have all protection activities planned or implemented in the vicinity of the lake. Additionally, sampled data from the lake should indicate evidence of stable aquatic plant populations in the lake relative to the conditions seen over 1976-1997.

**Delivery Agents:** Depending upon confirmation of impairment and assessment of probable sources, 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 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 Lower Arkansas 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:** Nutrient control has been proven effective through conservation tillage, contour farming, and use of grass waterways and buffer strips.

## **6. MONITORING**

KDHE will collect total phosphorus, dissolved oxygen, and pH samples from Kingman County SFL. Further sampling and evaluation should occur once before 2005 and once between 2005 and 2010.

## **7. FEEDBACK**

**Public Meetings:** Public meetings to discuss TMDLs in the Lower Arkansas Basin were held March 9 in Wichita, April 26 in Wichita and Hutchinson, and April 27 in Arkansas City and

Medicine Lodge. 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 Lower Arkansas Basin.

**Public Hearing:** A Public Hearing on the TMDLs of the Lower Arkansas Basin was held in Wichita on June 1, 2000.

**Basin Advisory Committee:** The Lower Arkansas Basin Advisory Committee met to discuss the TMDLs in the basin on September 27, November 8, 1999; January 13, 2000; March 9, 2000.

**Discussion with Interest Groups:** Meetings to discuss TMDLs with interest groups include:  
Agriculture: January 12, February 2 and 29, 2000  
Environmental: March 9, 2000  
Conservation Districts: November 22, 1999  
Industry: December 15, 1999, January 13, February 9 and 22, 2000  
Local Environmental Protection Groups: September 30, November 2, December 16, 1999

**Milestone Evaluation:** In 2005, evaluation will be made as to the degree of impairment which has occurred within the drainage and current condition of Kingman County SFL. Subsequent decisions will be made regarding implementation approach and follow up of additional implementation.

**Consideration for 303d Delisting:** Kingman County SFL will be evaluated for delisting under Section 303d, based on the monitoring data over the period 2005-2009. Therefore, the decision for delisting will come about in the preparation of the 2010 303d list. Should modifications be made to the applicable nutrient criterion 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 after Fiscal Year 2004.

Approved November 13, 2000.