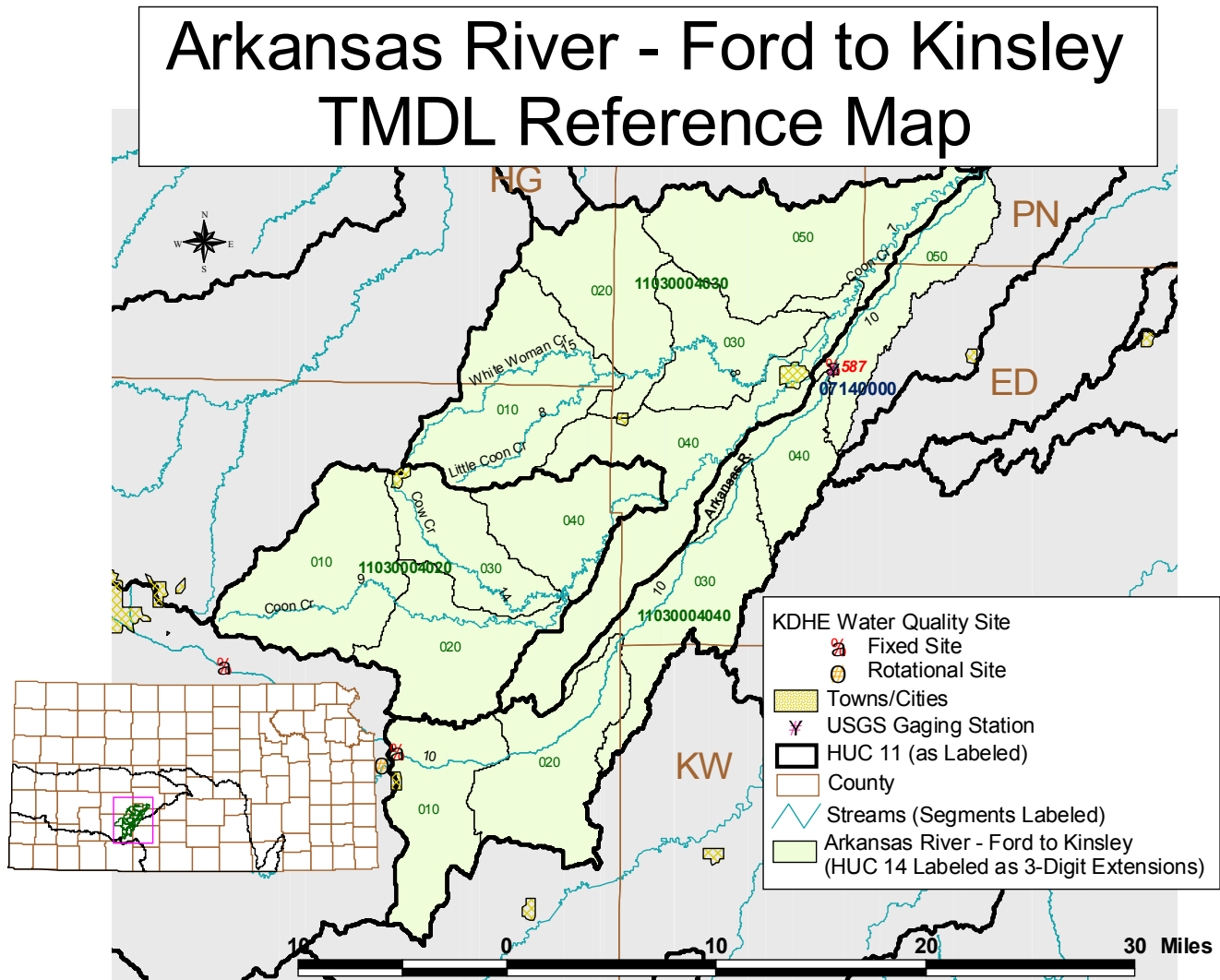




**Period of Record Used:** 1990 to 1999 (Station 587)

**Flow Record:** Arkansas River at Kinsley 1975 to 1999 (USGS Station 07140000)

**Long Term Flow Conditions:** Median Flow = 6.1 cfs, 7Q10 = 1 cfs



**Figure 1**

**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. Flow duration data were determined from the Kinsley Gage Station 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 Irrigation Use criterion by multiplying the flow values along the curve by the applicable water quality criterion and converting the units to derive a load duration curve of pounds per day. These load curves represent the TMDL since any point along the curve represents water quality at the standard at that flow. Historic excursions from WQS are seen as plotted points above the load curves. Water quality standards are met for those points plotting below the applicable load duration curves (Figures 2, 3 and 4).

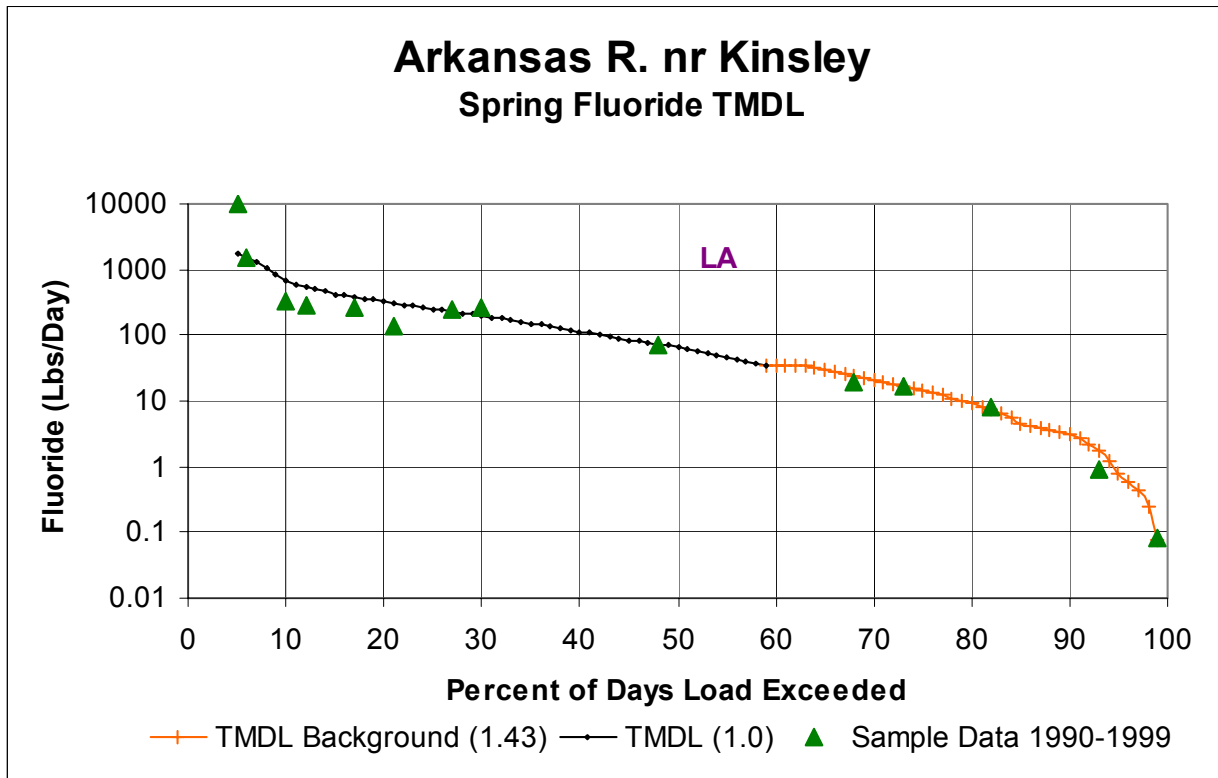


Figure 2

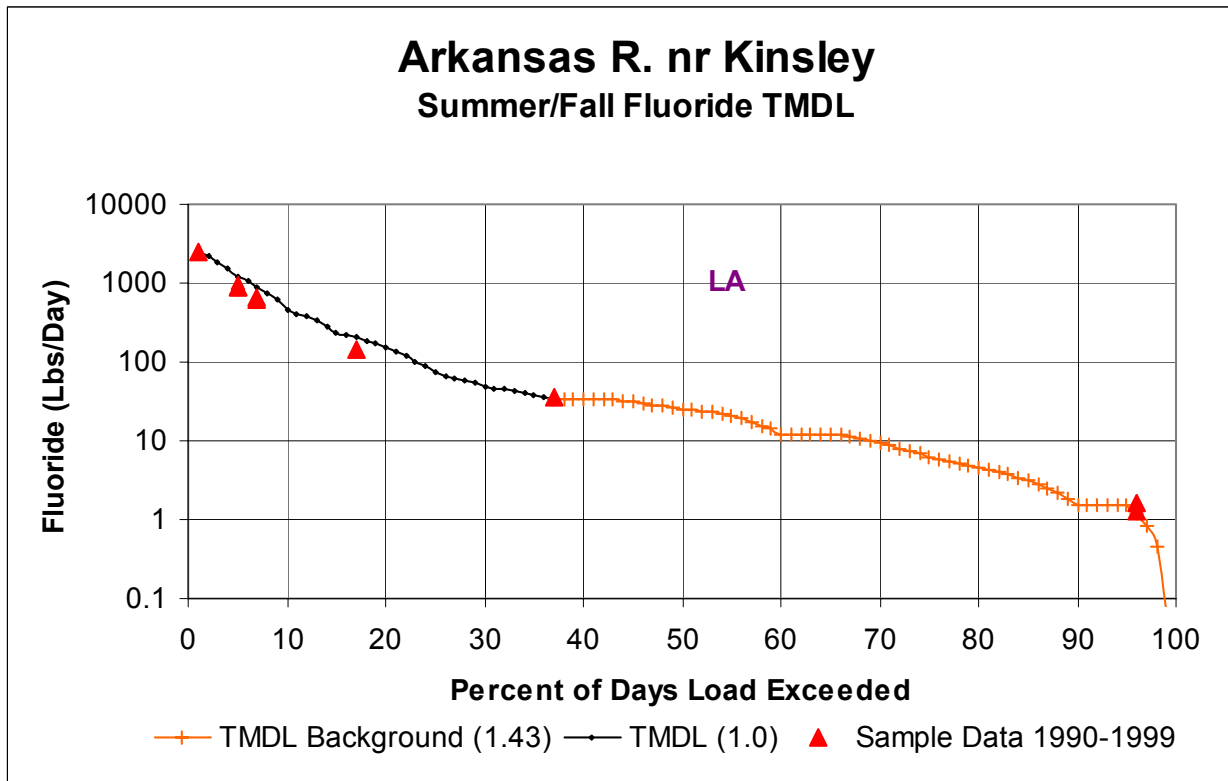


Figure 3

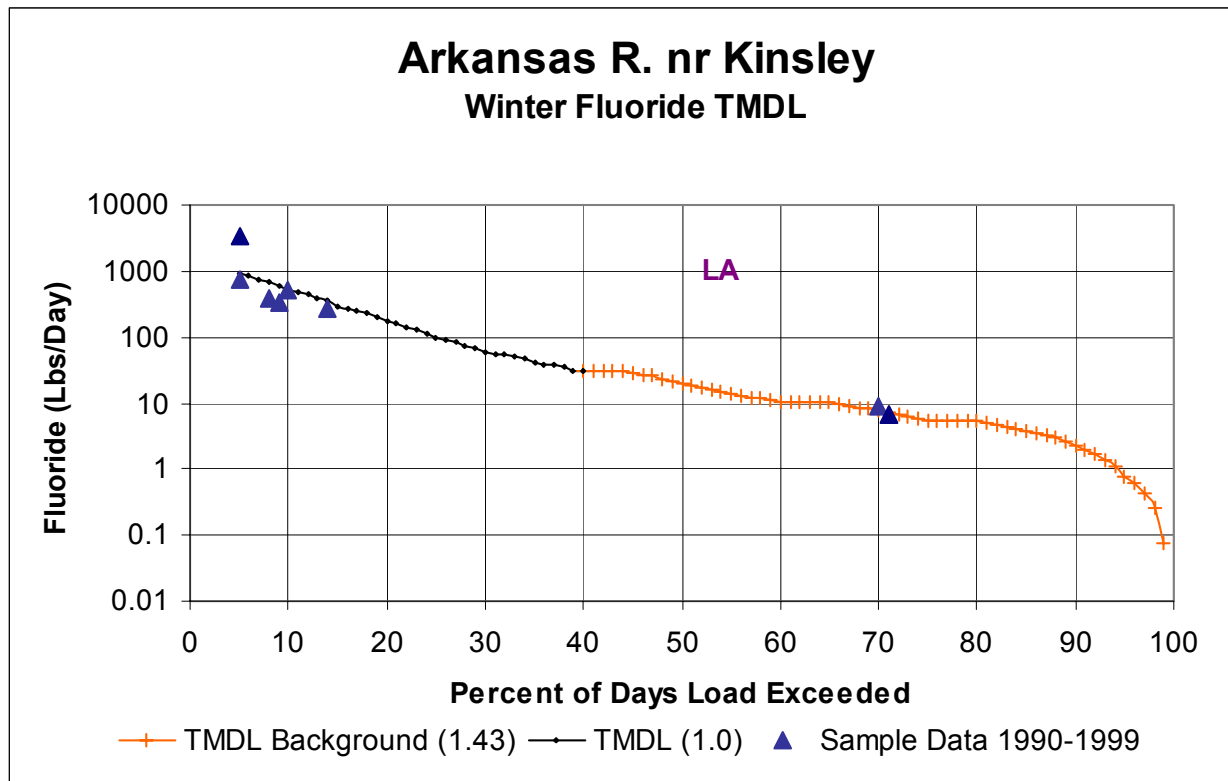


Figure 4

Excursions were seen in all three seasons. Fifty percent of Spring samples and 25% of Summer-Fall samples were over the secondary contact criterion. Thirty six percent of Winter samples were over the secondary criterion. Overall, 38% of the samples were over the criteria. This would represent a baseline condition of non-support of the impaired designated use.

**NUMBER OF SAMPLES OVER FLUORIDE STANDARD OF 1 mg/L BY FLOW AND SEASON**

| Station       | Season | 0 to 10% | 10 to 25% | 25 to 50% | 50 to 75% | 75 to 90% | 90 to 100% | Cum Freq.  |
|---------------|--------|----------|-----------|-----------|-----------|-----------|------------|------------|
| Kinsley (587) | Spring | 1        | 0         | 2         | 2         | 1         | 1          | 7/14 = 50% |
|               | Summer | 0        | 0         | 1         | 0         | 0         | 2          | 3/12 = 25% |
|               | Winter | 1        | 0         | 0         | 3         | 0         | 0          | 4/11 = 36% |

**Desired Endpoints of Water Quality (Implied Load Capacity) at Site 587 over 2005 - 2009:**

The ultimate endpoint for this TMDL will be to Achieve the Kansas Water Quality Standards fully supporting Irrigation Water Use. The current standard of 1 mg/L of flouride was used to establish a load duration curved on the TMDL curve. The likelihood of natural sources elevating low flow concentrations above the standard requires this TMDL, however, to be phased.

Kansas Implementation Procedures for Surface Water allow for a numerical criterion based on natural background to be established using the mean concentration of in stream measurements gathered when stream flow was less than the median flow on the river. A minimum of five data points is needed to determine the background concentration. The specific stream criteria to supplant the general standard will be developed concurrent with Phase One of this TMDL following the appropriate administrative and technical Water Quality Standards processes. Meanwhile, a Phase One endpoint has been developed for Segment 10 based on currently available information and is 1.43 mg/L from data collected over 1990-1999 at flows equal to or less than 6.1 cfs (**Figures 2, 3 and 4**). The Phase Two TMDL will be based on the future standard.

Seasonal variation has been incorporated in this TMDL through the documentation of the seasonal consistency of elevated fluoride levels at low flows. Achievement of the endpoints indicate loads are within the loading capacity of the stream, water quality standards are attained and full support of the designated uses of the stream has been restored.

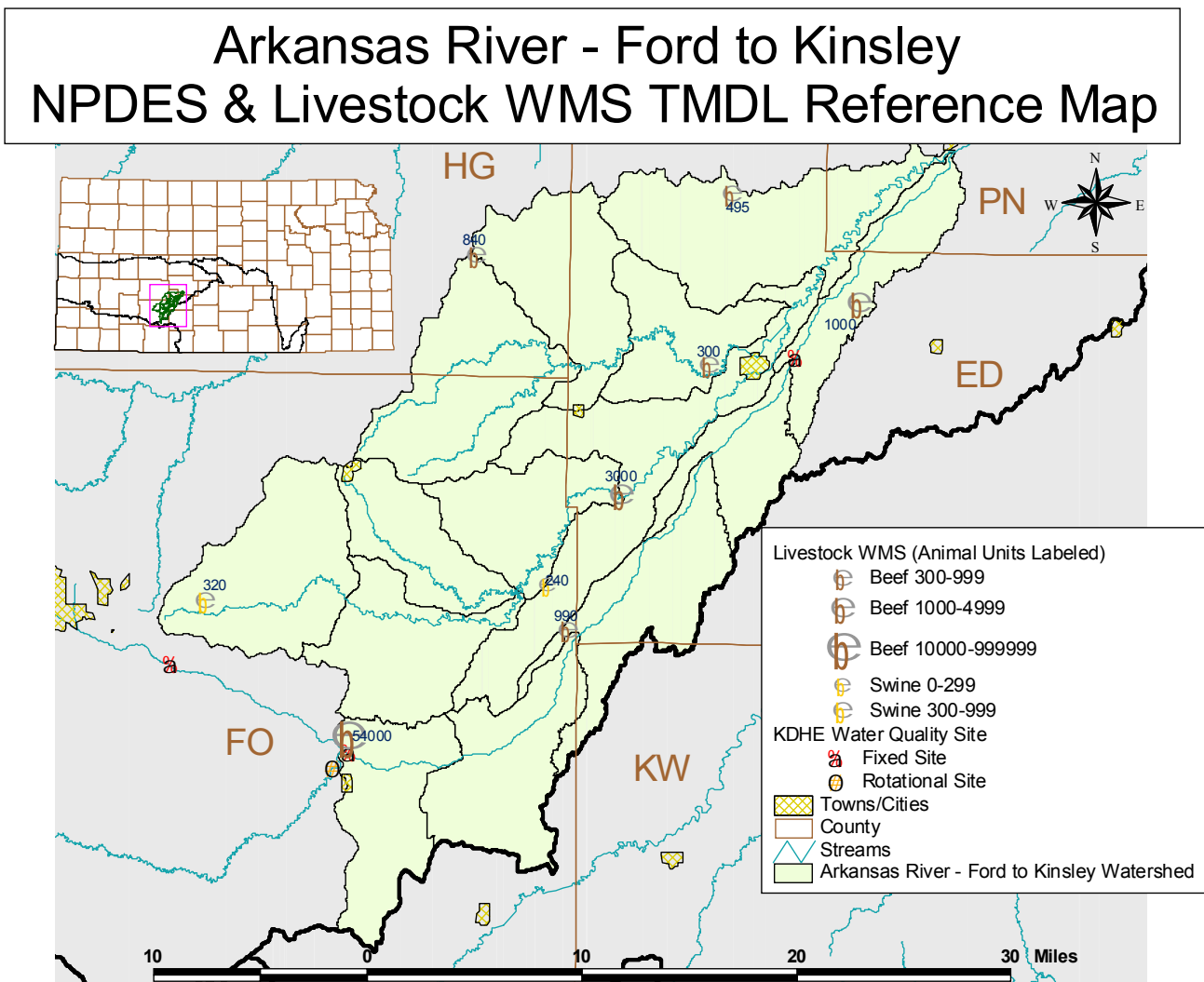
**3. SOURCE INVENTORY AND ASSESSMENT**

Groundwater contributing geologic formations north and west of the main stem in this watershed have a naturally occurring high level of fluoride. At baseflow, much of the fluoride in the surface water can be attributed to this natural contribution.

The most recent excursions (1998 and 1999) from the water quality standard appear to coincide with higher flow conditions. At the same time elevated fluoride samples at Kinsley were noted, there was elevated fluoride and flow at the Coolidge sampling station. This suggests transmittal of fluoride down the Arkansas River and might be associated with irrigation return flows off lands with flood irrigation. During the next five years upstream sources will be assessed to determine this contribution to fluoride loads at high flows.

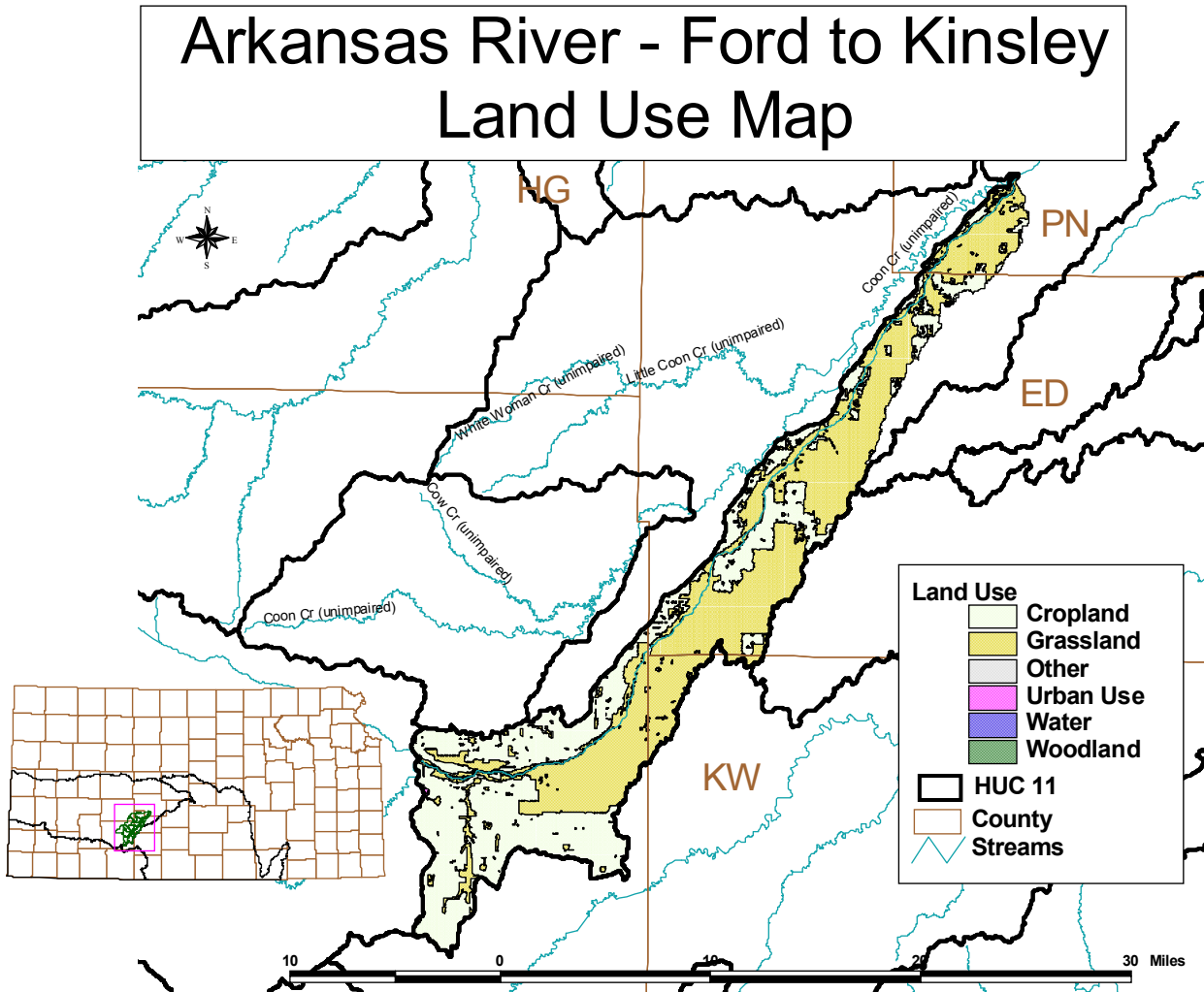
**NPDES:** There are no municipal waste water dischargers within the watershed.

**Livestock Waste Management Systems:** Three operations are registered, certified or permitted within the assessed watershed and are located within a mile of the main stem (**Figure 5**). All these operations are beef. Potential animal units for facilities within one mile of the main stem total 2,980. The actual number of animal units on site is variable, but typically less than potential numbers.



**Figure 5**

**Land Use:** Most of the assessed watershed is grassland (54% of the area), cropland (45% of the area) or woodland (1% of the area) (**Figure 6**). Based on 1997 water use reports, at least 34% of the cropland in the watershed is irrigated.



**Figure 6**

**Background Levels:** Some fluoride concentrations may be associated with environmental background levels, especially at baseflows. The areal distribution of fluoride contributing geologic sources, the Ogallala and Dakota groundwater formations, is to the north and west of the Arkansas River in Ford, Edwards and Pawnee County. At base flows these natural levels are sufficient to violate the water quality standards.

#### 4. ALLOCATION OF POLLUTION REDUCTION RESPONSIBILITY

Additional assessment will be necessary to ascertain the natural fluoride loading within the watershed and balance due to anthropogenic contributions. The following can be anticipated:

**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.

**Non-Point Sources:** The majority of fluoride load at baseflow appears background in nature. The Load Allocation will be 4.9 pounds per day of fluoride at the 7Q10 of 1 cfs and 30 pounds per day at the median flow of 6.1 cfs. This allocation will increase if the elevated background concentrations (1.43 mg/L) become the applicable criteria (6.9 lbs/day at 1 cfs and 42 lbs/day at 6.1 cfs). Exceedences are also noted at the highest flows. Additional assessment of the contribution from upstream sources is needed.

**Defined Margin of Safety:** The Margin of Safety will be ten percent of the applicable fluoride load, or 0.5 per day at 7Q10.

**State Water Plan Implementation Priority:** Because upstream sources are likely contributors to the fluoride problems seen at the monitoring station during more recent high flows and because additional source assessment is necessary to examine contributing activities along the main stem, this TMDL will be a Medium Priority for implementation.

**Unified Watershed Assessment Priority Ranking:** This watershed lies within Arkansas - Pickle (11030004) subbasin with a priority of 40 (Medium Priority for restoration work).

**Priority HUC 11s and Stream Segments:** Until additional assessment is done on source contribution upstream of this watershed between 2000-2005, priority focus of implementation prior to 2005 will concentrate on installing best management practices adjacent to the main stem and directly contributing tributaries.

#### 5. IMPLEMENTATION

##### Desired Implementation Activities

1. Minimize non-point oriented contributions of fluoride loading to river.

##### Implementation Programs Guidance

Until additional assessment of probable nonpoint sources is made, no direction can be



made to those nonpoint source implementation programs. Implementation of irrigation return flow BMPs within one mile of the main stem and directly contributing tributaries should be completed and their impact on the Arkansas River main stem evaluated prior to extending BMPs further from the main stem.

**Time frame for Implementation:** Additional non-point source pollution reduction practices should be installed within one mile of the main stem and directly contributing tributaries after the year 2005 re-evaluation and confirmation of the impairment.

**Targeted Participants:** Primary participants for implementation will be any targeted activities identified by follow up assessment of sources, conducted by KDHE, conservation district personnel and county Local Environmental Protection Program staff.

Based on the local assessment, implementation activities should focus participation within those areas with greatest potential for impact on stream resources.

**Milestone for 2005:** The year 2005 marks the midpoint of the ten-year implementation window for the watershed. At that point in time, additional monitoring data from Station 587 will be reexamined to confirm the impaired status of the streams within this watershed. Should the case of impairment remain, source assessment, allocation and implementation activities will ensue.

**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.

### **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 Upper 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 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 Medium Priority consideration and should not receive funding until after 2005.

**Effectiveness:** Improvements in reducing fluoride loading to streams can be accomplished through appropriate irrigation return flow management. Minimal control can be exerted on natural contributions to loading.

## 6. MONITORING

KDHE will continue to collect bimonthly samples at Station 587, including fluoride samples over each of the three defined seasons during the initial implementation period. During the evaluation period (2005-2009), more intensive sampling will need to be conducted under specified seasonal flow conditions in order to determine the achievement of the desired endpoint of this TMDL. The manner of evaluation will be consistent with the assessment protocols used to establish the case for impairment in these streams. Following current (1998) Kansas assessment protocols, monitoring will ascertain if less than 10% of samples exceed the applicable criterion. Use of the real time flow data available at the Kinsley stream gaging station can direct sampling efforts.

USGS should complete analysis of SSURGO soil data and 30-m resolution DEM topographic data to evaluate the relative runoff contributing areas within the watershed and provide greater resolution on where implementation activities would be most effective. This analysis should be complete in 2000.

## 7. FEEDBACK

**Public Meetings:** Public meetings to discuss TMDLs in the Upper Arkansas Basin were held March 8 and April 24 in Garden City and April 25, 2000 in Great Bend. 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 Upper Arkansas Basin.

**Public Hearing:** A Public Hearing on the TMDLs of the Upper Arkansas Basin was held in Garden City on May 31, 2000.

**Basin Advisory Committee:** The Upper Arkansas Basin Advisory Committee met to discuss the TMDLs in the basin on October 6, 1999; January 11 and 24, 2000; March 8, 2000;

**Discussion with Interest Groups:** Meetings to discuss TMDLs with interest groups include:  
Associated Ditches of Kansas: October 6, 1999; January 28, 2000; March 8, 2000; and April 24, 2000.  
Agriculture: February 28, 2000  
Environmental: March 9, 2000

**Milestone Evaluation:** In 2005, evaluation will be made as to the degree of impairment which has occurred within the watershed and current condition of the listed stream segments. Subsequent decisions will be made regarding implementation approach and follow up on additional implementation in subwatersheds.

**Consideration for 303(d) Delisting:** This 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 applicable criterion during the ten year implementation period, consideration for delisting, desired endpoints of this TMDL and implementation activities may be adjusted accordingly.

For this TMDL, assessment for delisting will evaluate if the percent of samples over the applicable criterion is less than 10% for samples taken over the monitoring period of 2005-2009. This assessment defines full support of the designated use under water quality standards as measured and determined by current Kansas Water Quality Assessment protocols. These assessment protocols are similar to those used to cite the stream segments in this watershed as impaired on the Kansas 1998 Section 303d list. As protocols and assessments for impairment change for future 303(d) lists, the monitoring data collected under this TMDL will use these new assessments and protocols for delisting consideration.

**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 2005.

Approved September 11, 2000