Implementing Nutrient Limits via Antidegradation

Kansas
Department of Health and Environment

2017 Nutrient Permitting Workshop

December 6, 2017

Tom Stiles, KDHE – BOW

Kansas has pushed nutrient reduction since 2004

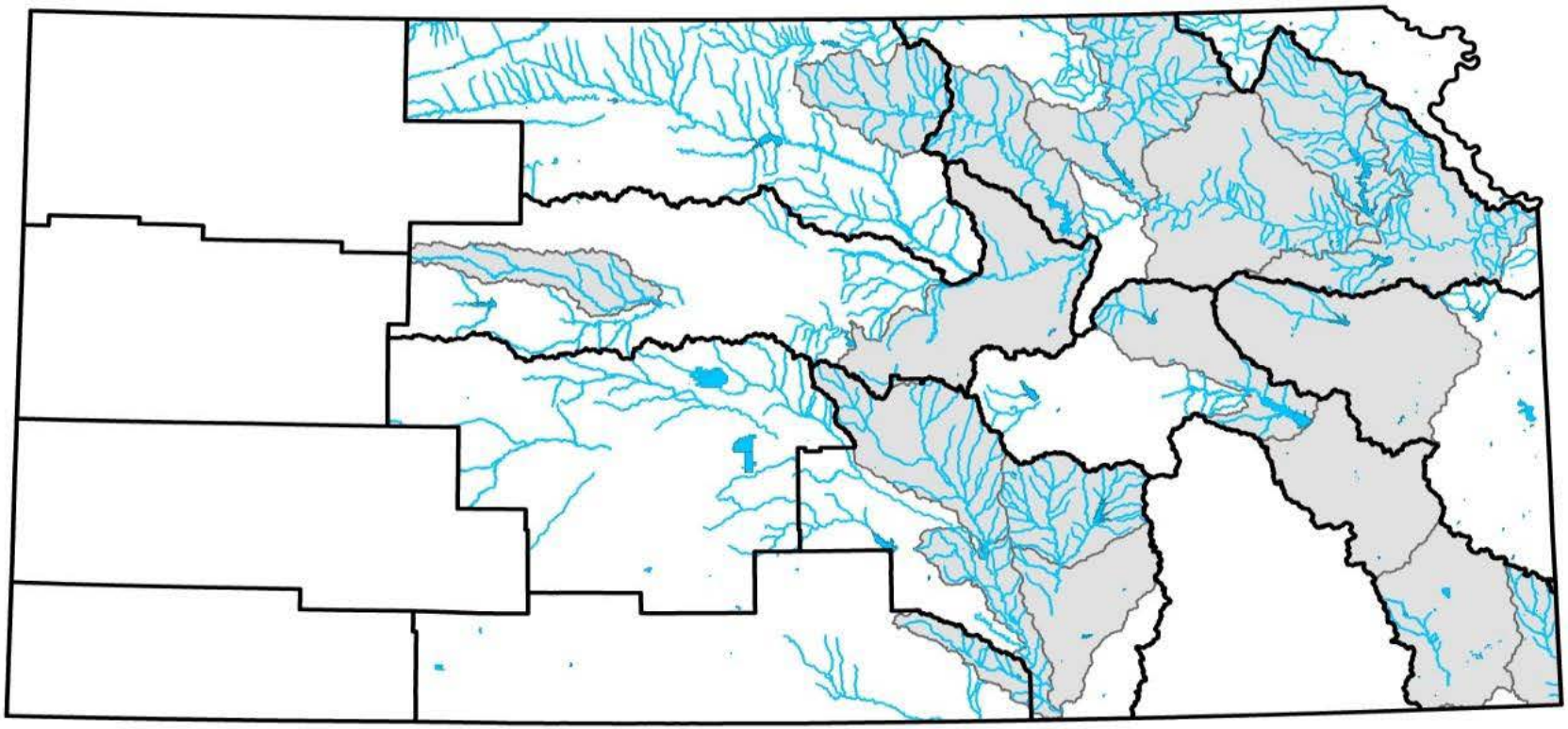
- Nutrient Reduction Framework offered as an alternative to numeric nutrient criteria – predated the Stoner memo by 7 years
- Overarching goals were 30% reduction in nitrogen and phosphorus loads leaving the State
  - Nitrogen viewed as an external issue – Gulf of Mexico
  - Phosphorus viewed as more critical local issue – Kansas reservoirs and streams
  - Almost all streams leaving Kansas wind up in a Nebraska, Missouri or Oklahoma reservoir or the Missouri River
- Push Major POTWs to evaluate installing nutrient reduction at three levels
  - BNR: 8 mg/l TN & 1.5 mg/l TP (later offered at 10 mg/l TN & 1 mg/l TP)
  - ENR: 5 mg/l TN & 0.5 mg/l TP
  - LOT: 3 mg/l TN & 0.3 mg/l TP
- Subsequent implementation was to be done via
  - NPDES Permitting
  - Total Maximum Daily Loads
  - NPS Watershed Management (WRAPS)

TMDLs and 303(d) Listings

- Most reservoirs had eutrophication impairments
- In 2008, Kansas began listing streams for TP if median > 201 ppb
- Nitrate > 10 mg/l was an impairment in selected streams – typically below mechanical POTWs
- 2016 TMDL Prioritization Framework for Vision Strategy made streams in eastern and central Kansas impaired by phosphorus the priority for TMDLs to 2022.

Kansas
Department of Health and Environment

- TMDL Priority Basins 2012 - 2022



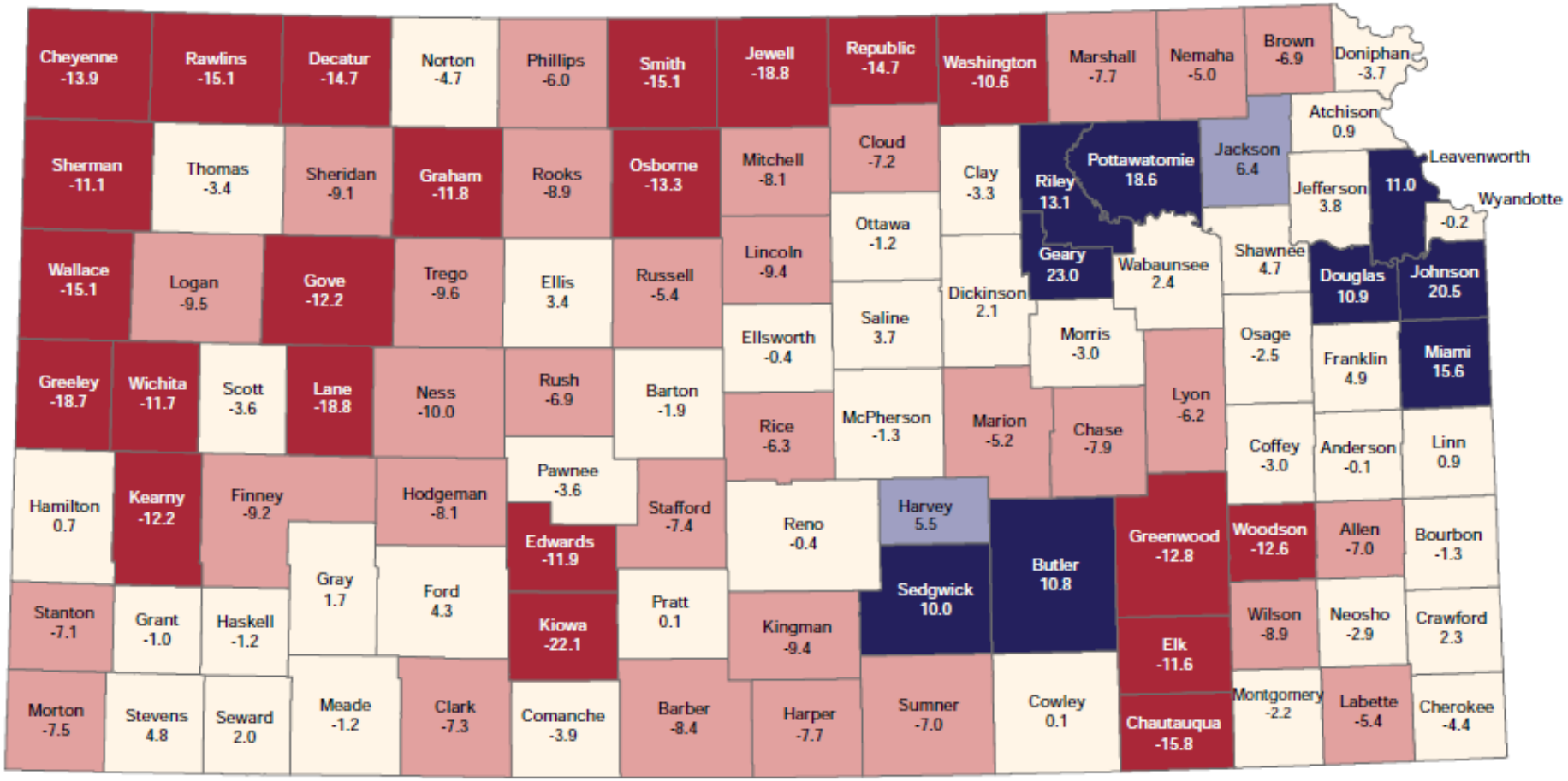
Two Major Factors Create High TP in Streams

- Major and large Minor POTWs and Industrial Wasteloads
- Land Use dominated by Row Crop Agriculture
- Hydrology is important, too, for transport and loading (East >> West)

TMDLs Drove Initial Investment in BNR

- Set effluent goals of 1.0 – 1.5 mg/l
- Set effluent mass limits based on goals and design flows; compliance determined on 12-month moving average of mass
- Allows for management of nutrients in the long term
- Opens door to reuse and land application as means of mass reduction – parks, ball fields, golf courses, cropland (*subject to water appropriation law*)
- Reduces compliance issues brought about by biological processes working against concentrations
- **This is not a toxic issue**

Percent Population Change in Kansas, by County
2000 - 2010



State: 6.1

Source: Institute for Policy & Social Research, The University of Kansas; data from U.S. Census Bureau.

Percent Population Change

- less than -10.0
- -10.0 – -5.0
- -4.9 – 5.0
- 5.1 – 10.0
- greater than 10.0

Kansas Antidegradation Policy

- Applies to New and Expanding Sources that impact existing water quality
- Treats Tier 2 as pollutant X pollutant
- Facility evaluates alternatives to discharge to justify why discharge is preferred option

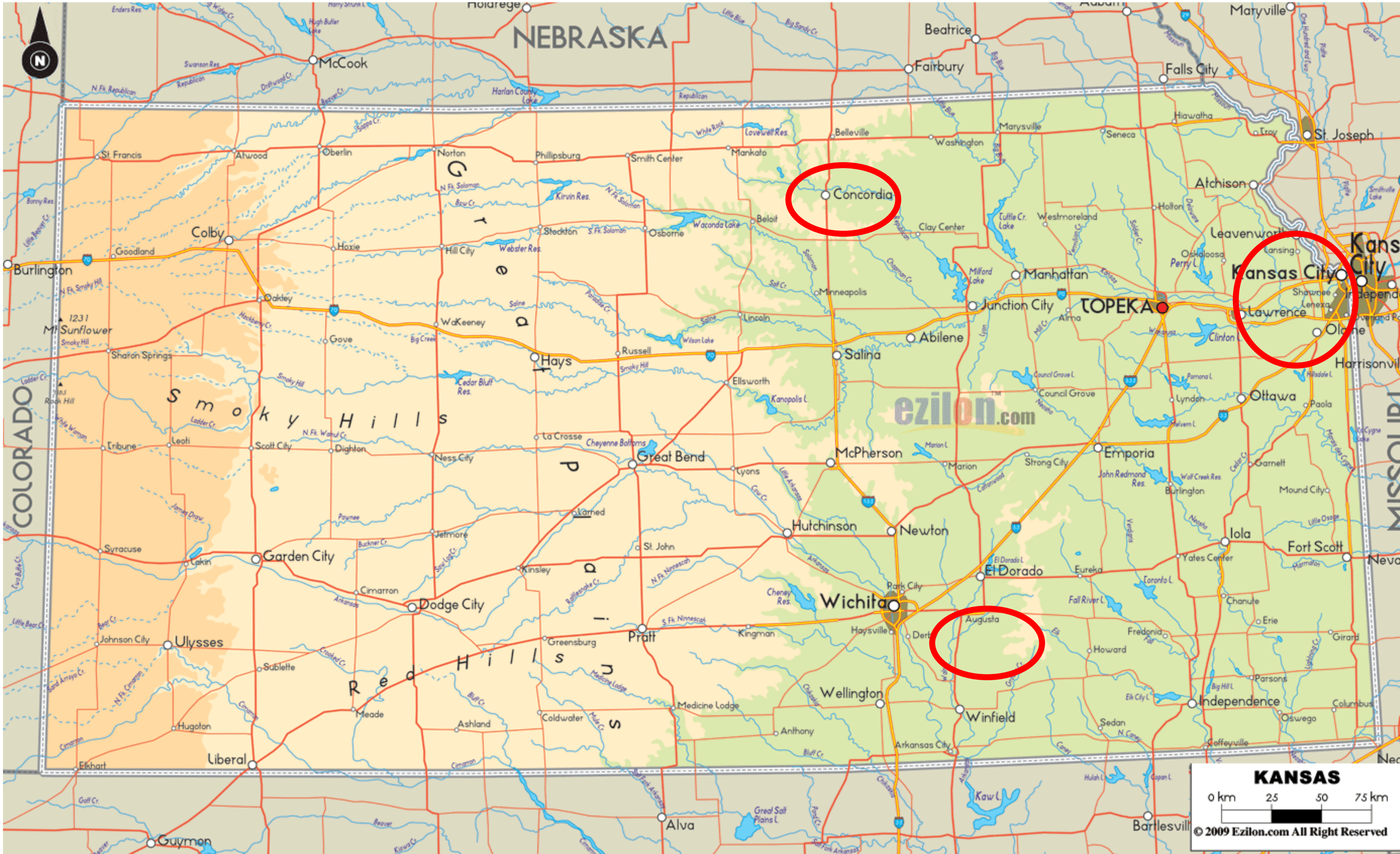
Tier 2 Antidegradation

- *Degradation allowed if:*
  - *Important social or economic development*
  - *Designated uses still maintained*
  - *Highest point source requirements in place*
  - *Cost effective, reasonable NPS BMPs*
- *"Cause or Contribute to" impairment*

Application of Antidegradation Policy for Nutrients

- If capital can be raised to expand or build a mechanical wastewater treatment plant, Kansas expects a financial increment dedicated to nutrient reduction.
- Financing is going to be backed by a growing population base and/or industrial users (direct or indirect)
- Expectation typically will be ENR
  - (Goal of 0.5 mg/l & associated **Mass LIMIT**)

Kansas
Department of Health and Environment



Our Mission: To protect and improve the health and environment of all Kansans.

Kansas Department of Health and Environment

Early Application: Edgerton

- Small town on outskirts of Metro KC
- Discharges into drainage of Hillsdale Lake, a Corps reservoir providing public water supply and impaired by eutrophication
- Old oxidation ditch with design flow of 0.18 MGD
- Development of major intermodal commerce and shipping center in vicinity
- Edgerton built new Schreiber plant at 1 MGD to handle regional growth
- Limits established based on 0.5 mg/l TP (4.2 #/d) & 8 mg/l TN (just a goal – see Thursday talk)

Major Expansion: Johnson County

- Tomahawk Creek WWTP discharges to Indian Creek
- Wet weather conditions force diversion of intercepted sewage to KC MO
- TP impairment and Nitrate TMDL
- Expansion and upgrade eliminates wet weather diversion and reduces nutrient output = 10 → 19 MGD
- Alternatives analysis and modeling established tradeoff between stream condition and cost
- TP mass limit put in place = 79.2 #/d (No TMDL needed)
- Nitrate kept below 10 mg/l (streambed shear offsets need to drive TN < 5 mg/l)

Phased Implementation

- Wichita Four Mile Creek Plant expanding from 3 MGD to 6 MGD
- Four Mile Creek is tributary to Walnut River, both impaired by phosphorus
- Financial assessment unveiled issues with immediate imposition of 0.5 mg/l goal; initial goal set at 0.75 mg/l
- Mass limit starts at 18.5 #/d with expansion to 37.6#/d
- Biological monitoring will support need to reduce to 0.5 mg/l and 25.1 #/d via chemical feed in future.
- Water reuse option will forestall need for chemicals

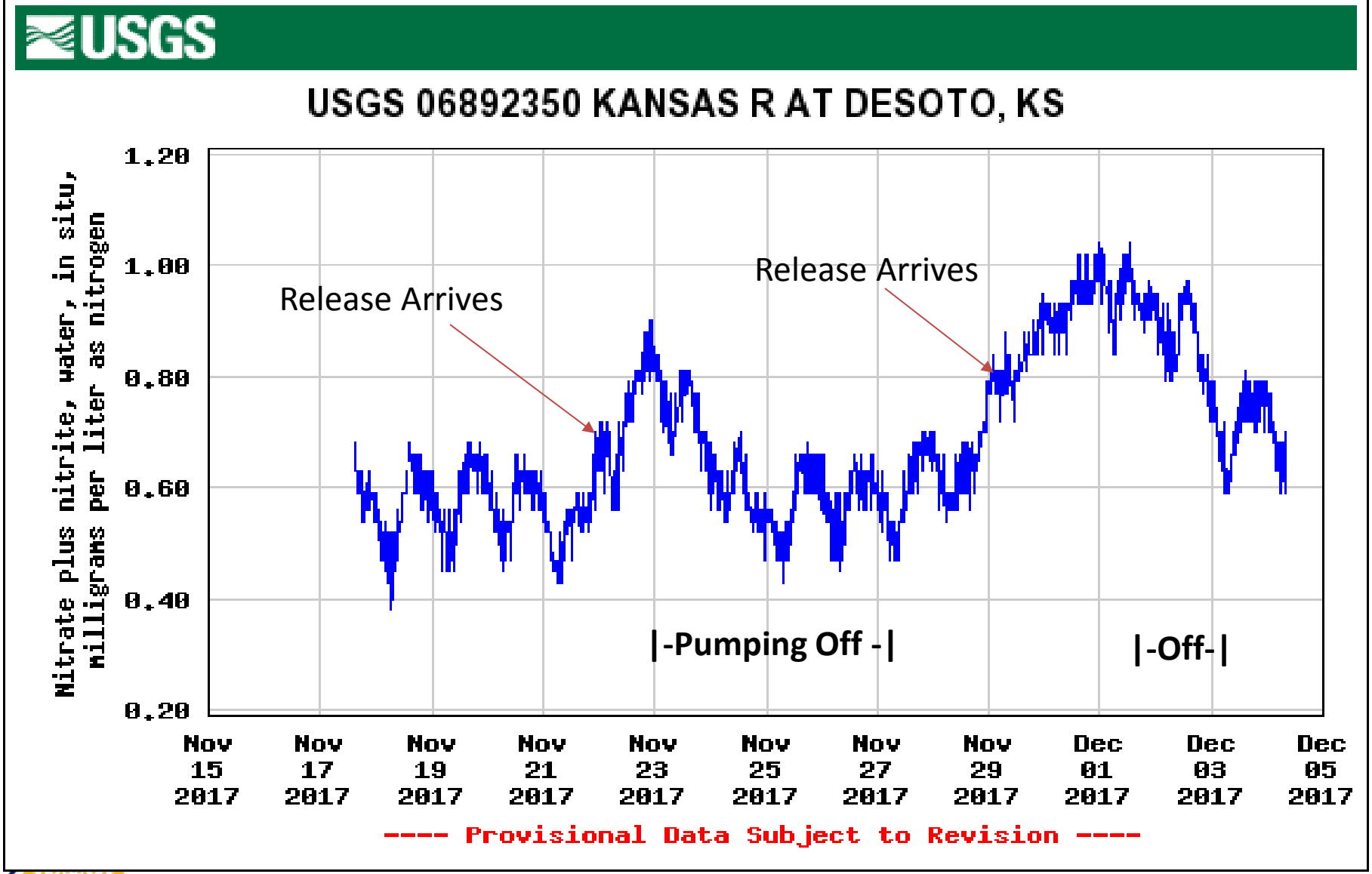
Projected Issue: Poultry Plant

- Processing Plant of up to 3 MGD initially sited for northeast Kansas with discharge to Kansas River
- Antideg would impose mass limit based on 0.5 mg/l
- Social media outrage caused plans to be withdrawn
- Alternative site would be in north-central Kansas in drainage to Milford Lake
- Milford Lake is Corps reservoir with regional PWS and recreation functions…and Lake Erie – like HABs
- If located there, antidegradation would emulate siting on Chesapeake Bay…0.3 mg/l TP and 6 mg/l TN

Temporary Degradation

- Fertilizer Plant Remediation Project at Lawrence
- Ground water chock full of nitrate and ammonia
- Remediation intercepts ground water plumes and stores them for subsequent land application
- Site improvements increased the volume captured
- Surrounding farmland switched crops, no need for nitrogen water
- 8 million gallons of 2000+ mg/l N stored in tanks;
- 22 million gallons of 400 mg/l N stored in ponds
- Storage at brim; KDHE authorized conditional release to Kansas River

Conditions lead to marginal impact



Take Away Messages

- Antidegradation raises the bar of expectation on new and expanded dischargers, sets stage for long term
- Solutions meet demographic and industrial demands while requiring investment in nutrient reduction
- Once those investments are made, the nutrient condition at baseflow is secured
- After that, nutrient reduction under wet weather is directed to NPS management, likely for decades
- Kansas, as a rural state with select growth corridors, has to take advantage when and where nutrient regulation can be applied

Tom Stiles
Assistant Director, BOW
Tom.stiles@ks.gov
www.kdheks.gov/water/www.html

Kansas
Department of Health and Environment