Interfacing Nutrient TMDLs with NPDES

or

"After 6 Years of the Vision, How the Hell Did We Miss This?"

Tom Stiles

Kansas Department of Health & Environment

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Three Primary Prongs of the CWA

- Water Quality Standards

- Total Maximum Daily Loads

- NPDES Permitting

303(d) Program: Bridging the Gap

Environmental Data & Goals → 303(d) & TMDLs → Implementation

Monitoring

Permitting

Standards

Non-point Source

Total Maximum Daily Loads – Sec 303(d)

- Rebalance Loadings that have created exceedances in criteria (impairment), thereby implementing the applicable water quality standards
- Wasteload Allocations for Point Sources
  - Implemented by NPDES
- Load Allocations to Non-Point Sources
  - Implemented by Financial Incentives or Non-Federal Programs
- Margin of Safety provides a hedge
  - Protects the environment from overloading
- Not self – implementing
  - But can guide implementation efforts

NPDES Permits – Sec 402

- Effluent limitations in the permit implement the WLAs of TMDLs
  - 303(d)(4)(A): backsliding – revised effluent limits only if the cumulative effect of all such revisions based on TMDL will assure attainment of WQS, and:
  - 303(d)(4)(B): antidegradation – where waters exceeds necessary quality, revised effluent limits are consistent with antidegradation policy established under this section
- Within Sec 402, only (o) antibacksliding, ties back to Sec 303
- Backdoor tie-ins via Secs 301 & 401

NPDES Regulations Tied to WQS/TMDLs

- 40 CFR 122.44(d)(1): Permit requirements in place to achieve WQS, including narrative criteria – typically through effluent limits

- 122.44(d)(1)(vii): Effluent limits shall ensure that:

  - **A. Limits are derived from and comply with WQS**

  - **B. Limits are consistent with assumptions and requirements of WLA for the discharge under a TMDL**

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

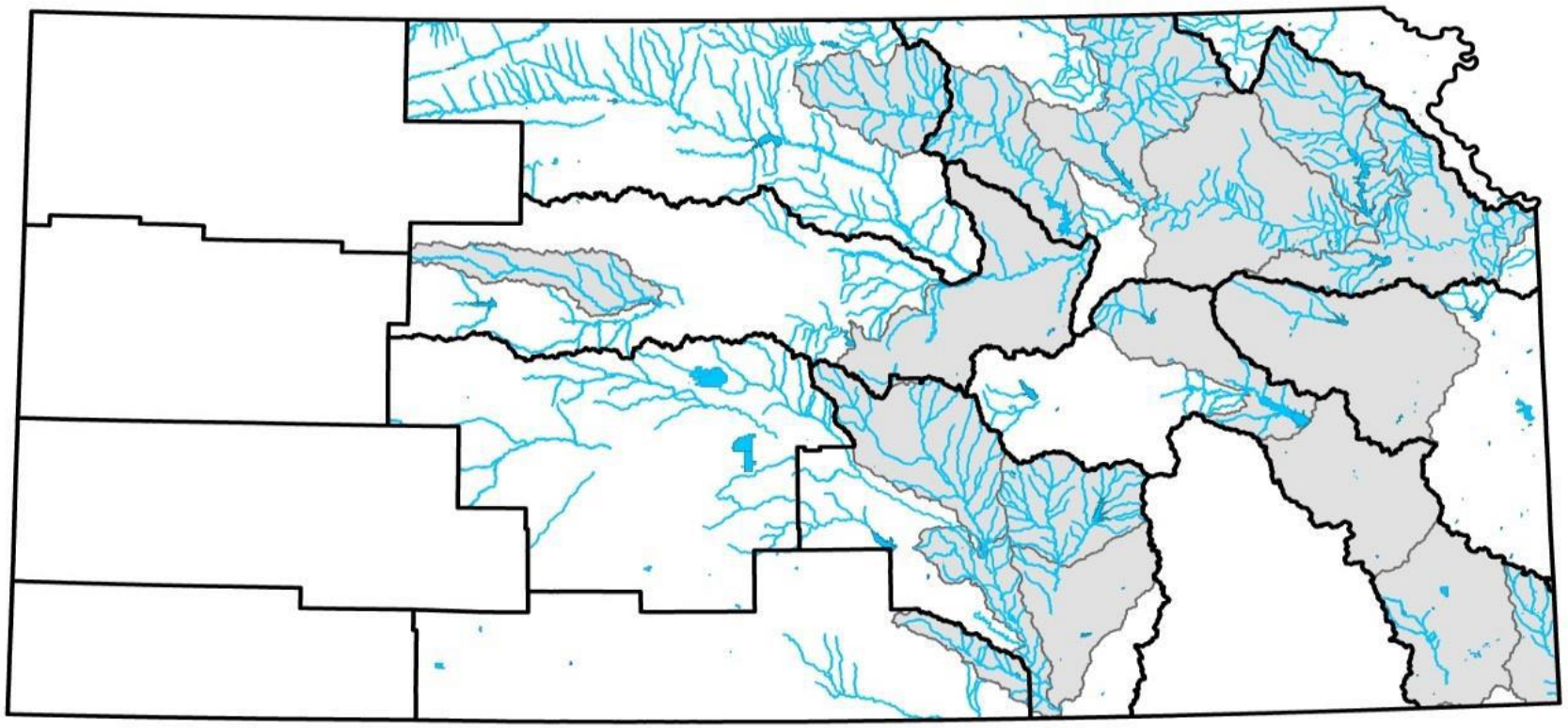
- Push Major POTWs to evaluate installing nutrient reduction at three levels
  - BNR: 8 mg/l TN & 1.5 mg/l TP (later offered at 10 mg/l TN & 1 mg/l TP)
  - ENR: 5 mg/l TN & 0.5 mg/l TP
  - LOT: 3 mg/l TN & 0.3 mg/l TP

- Subsequent implementation was to be done via
  - NPDES Permitting
  - Total Maximum Daily Loads
  - NPS Watershed Management (WRAPS)

On NPS front, phosphorus easier to control than nitrogen (sediment vs water)

Nitrate in Kansas is a ground water/drinking water issue – linked to fertilizer/manure applications

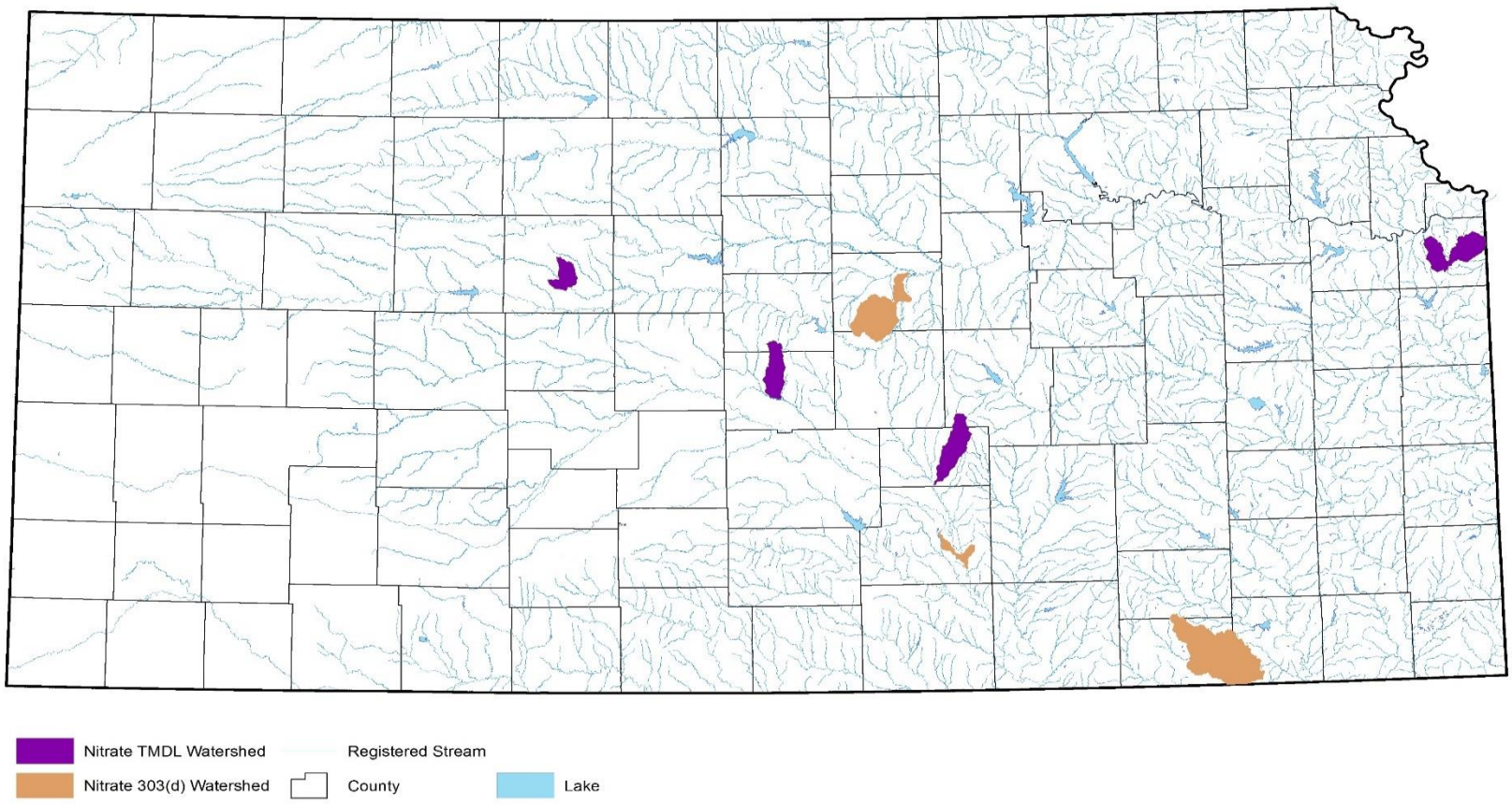
- TMDL Priority Basins 2012 – 2022 – TP & NO3 TMDLs



Two Drivers for Nitrogen Reduction

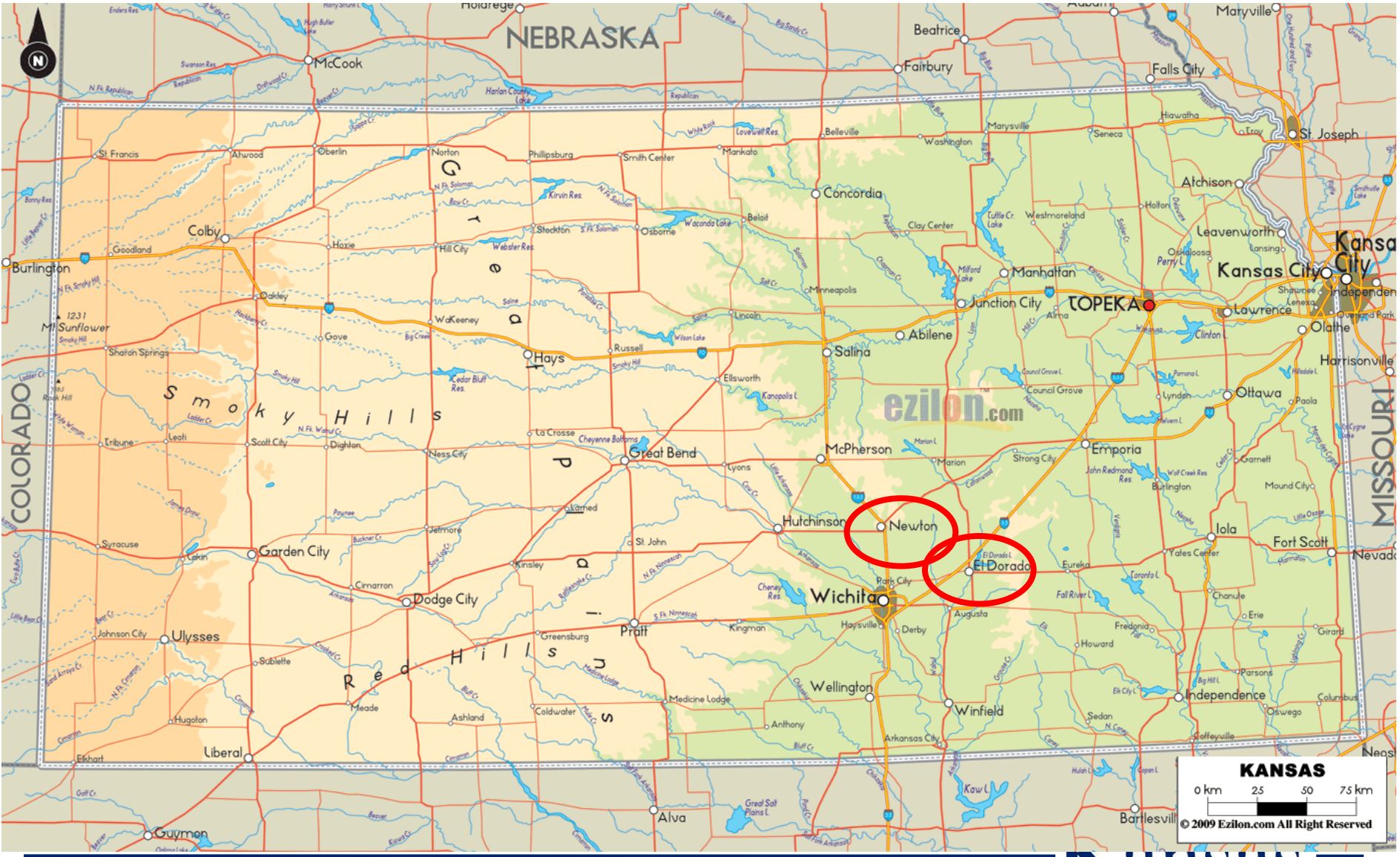
- Kansas adopted the 2013 ammonia criteria – rich database of historic presence of mussel communities throughout state.
- Essentially ammonia will be at or below 1 mg/l in streams to avoid long term degradation
- Nitrate TMDLs push POTWs to upgrade operationally to denitrify < 10 mg/l (WQC)

Stream Nitrate Impairments almost always linked to NPDES



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**



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Success Story: City of Newton

Nitrate & TP TMDLs on Sand Creek

Nitrate (& Nitrite) WLA = 174 #/d (7 mg/l goal –MOS penalty)

Phosphorus WLA = 37.6 #/d
Both based on 3 MGD

As POTW plant expands from 3 to 4.4 MGD (lowers effective goals for N & P)

Permit Expectations

Upgrades treatment to BNR;
went online in Jan 16

TP Mass limits PLUS 10 mg/l NO3 limit

Ammonia remains non-issue now and forever….

2014-15 # of NH3 detects = 68% (1.8 mg/l avg)

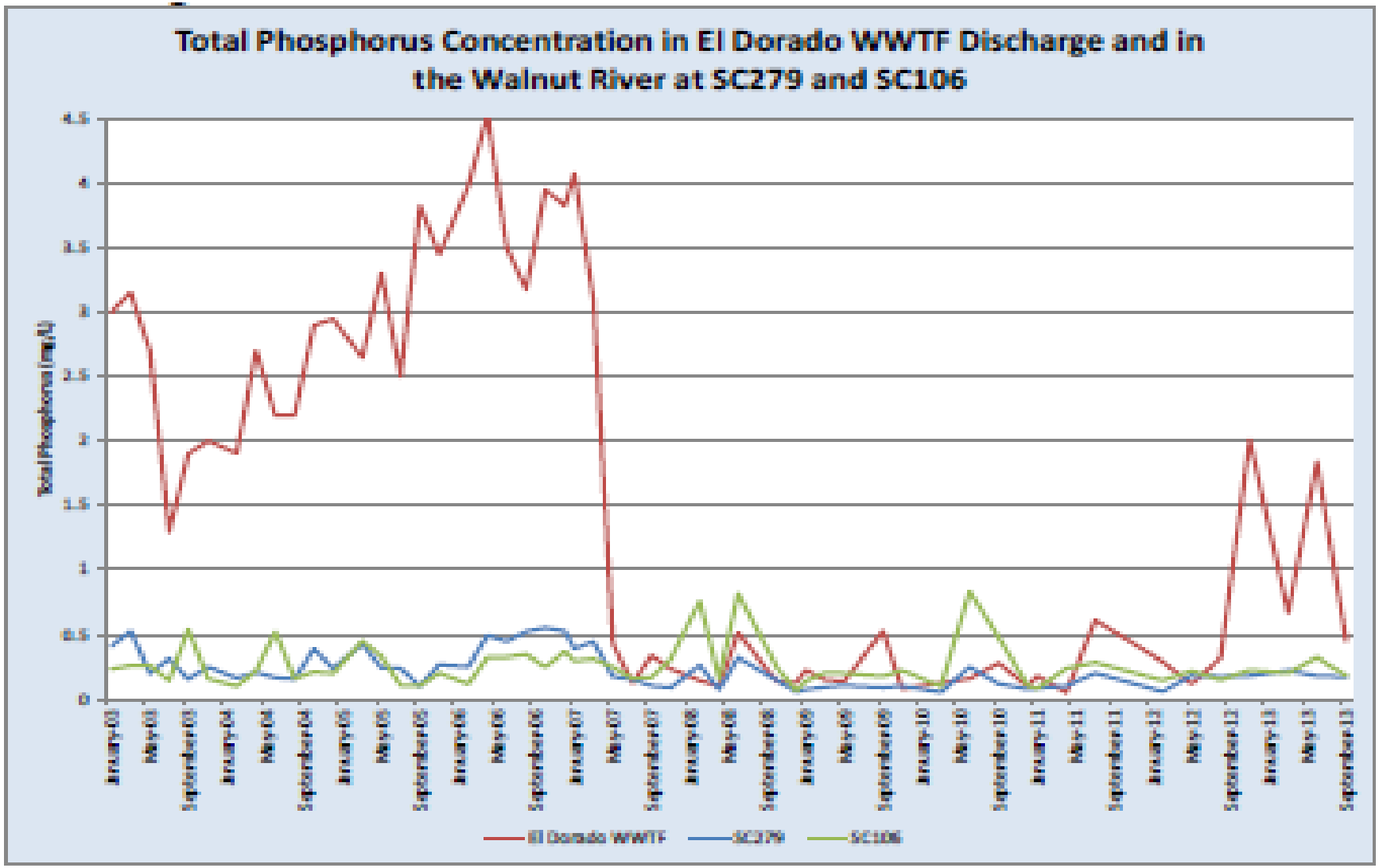
2016-17 # of NH3 detects = 31% (0.25 mg/l avg)

Denitrification, wetland polishing, reuse all lead to lowered nitrate input into Sand Creek

Newton's Tale of the Tape

Parameter	2014 – 2015	2016 - 2017	Change
NO3 Conc.	6.2 mg/l	3.0 mg/l	- 52%
TN Load	128 #/d	61 #/d	- 55%
Downstream NO3	2.9 mg/l	1.1 mg/l	- 62%
TP Conc	3.3 mg/l	1.2 mg/l	- 64%
TP Load	43 #/d	13 #/d	- 70%
Downstream TP	1.56 mg/l	0.67 mg/l	-57%

El Dorado's Optimal BNR Performance



The one complication: Lagoons

- Typical choice of small town Kansas
- Three, four or five cell detention systems
- Provide very good, very “green” wastewater treatment
  - KDHE Study: Well designed, well run facultative lagoon will produce 10 mg/l of TN and 2 mg/l of TP….Not Bad….
- But not likely to be able to meet any nutrient criteria
- Financial capabilities of small towns do not lend themselves to bringing on a mechanical plant
- Created a Multi-Discharger Variance to cover these systems against new ammonia criteria; reset limit at historic 99% value of actual output – Process for approval was exhausting
- Would have to do the same thing for phosphorus limits
- What is the point of setting criteria/limits if over half the discharging facilities would need a variance?

Take Away Messages

- WQS are science, but science can't solely dictate policy
- TMDLs are more than math, have to create innovative strategic paths into the future to create options for NPDES, easily digested by permit writers
- NPDES needs to escape thinking in the steady state, becoming more dynamic brings about flexibility to handle the unforeseen
- Communication between all three CWA sectors has to be constant and innovative
- We can't tell the future but it'll want "YES" answers
- To get there, TMDLs need to be more "permit-ready"

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

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