Iowa Department of Natural Resources

Leading Iowans in caring for our natural resources

Technology Limits and Water Quality Standards: Iowa's Perspective

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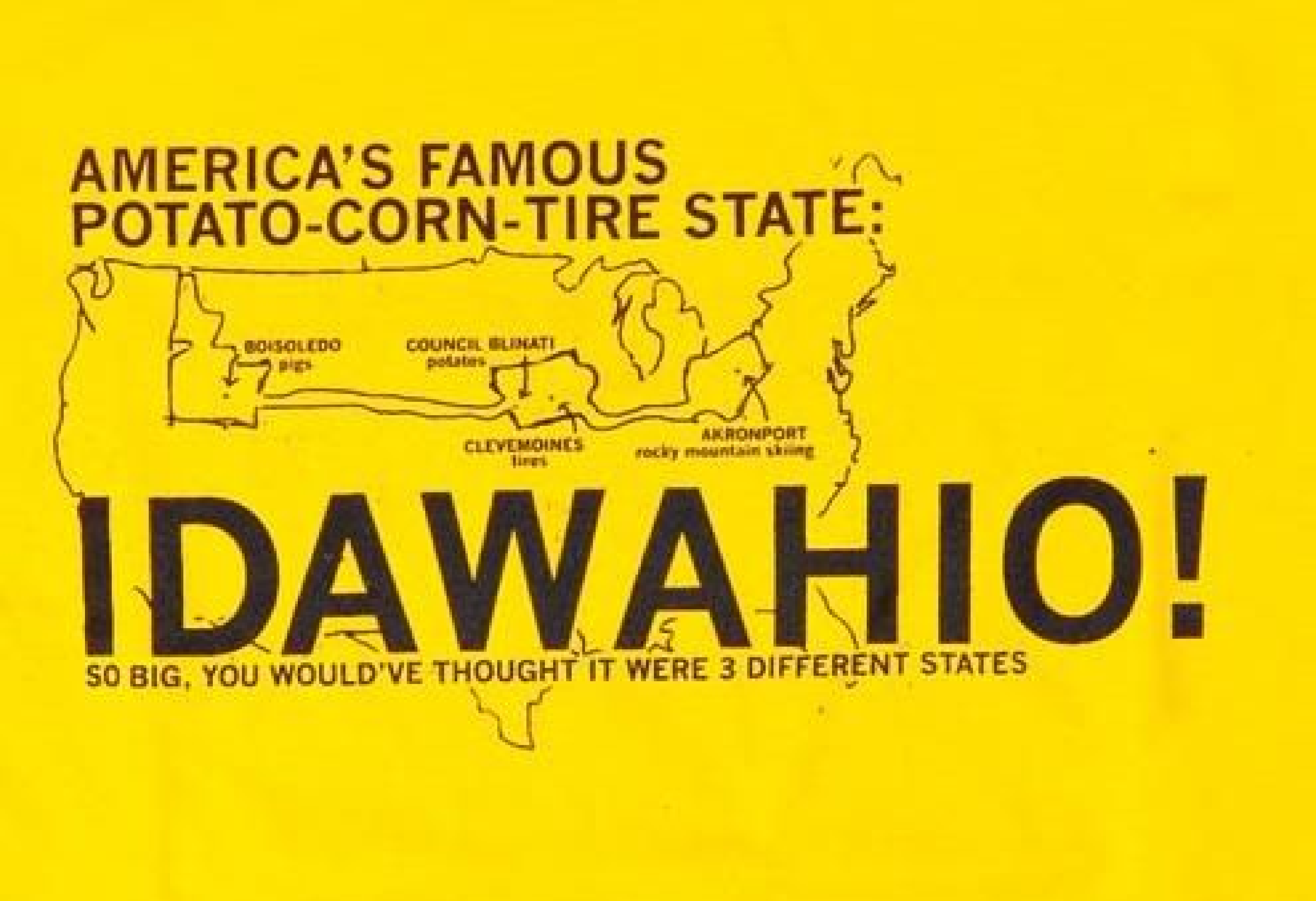


AMERICA'S FAMOUS
POTATO-CORN-TIRE STATE:
BOISOLEDO
pigs
COUNCIL BLINATI
potatoes
CLEVEMOINES
tires
AKRONPORT
rocky mountain skiing
IDAWAHIO!
SO BIG, YOU WOULD'VE THOUGHT IT WERE 3 DIFFERENT STATES

What we’ve learned

- NNC, no matter how you slice it, will be at or beyond what modern wastewater technology can reliably achieve
- There’s too much nutrients out there and reductions are needed from ALL sources

The End Game

Secondary
25 mg/l TN
4 mg/L TP

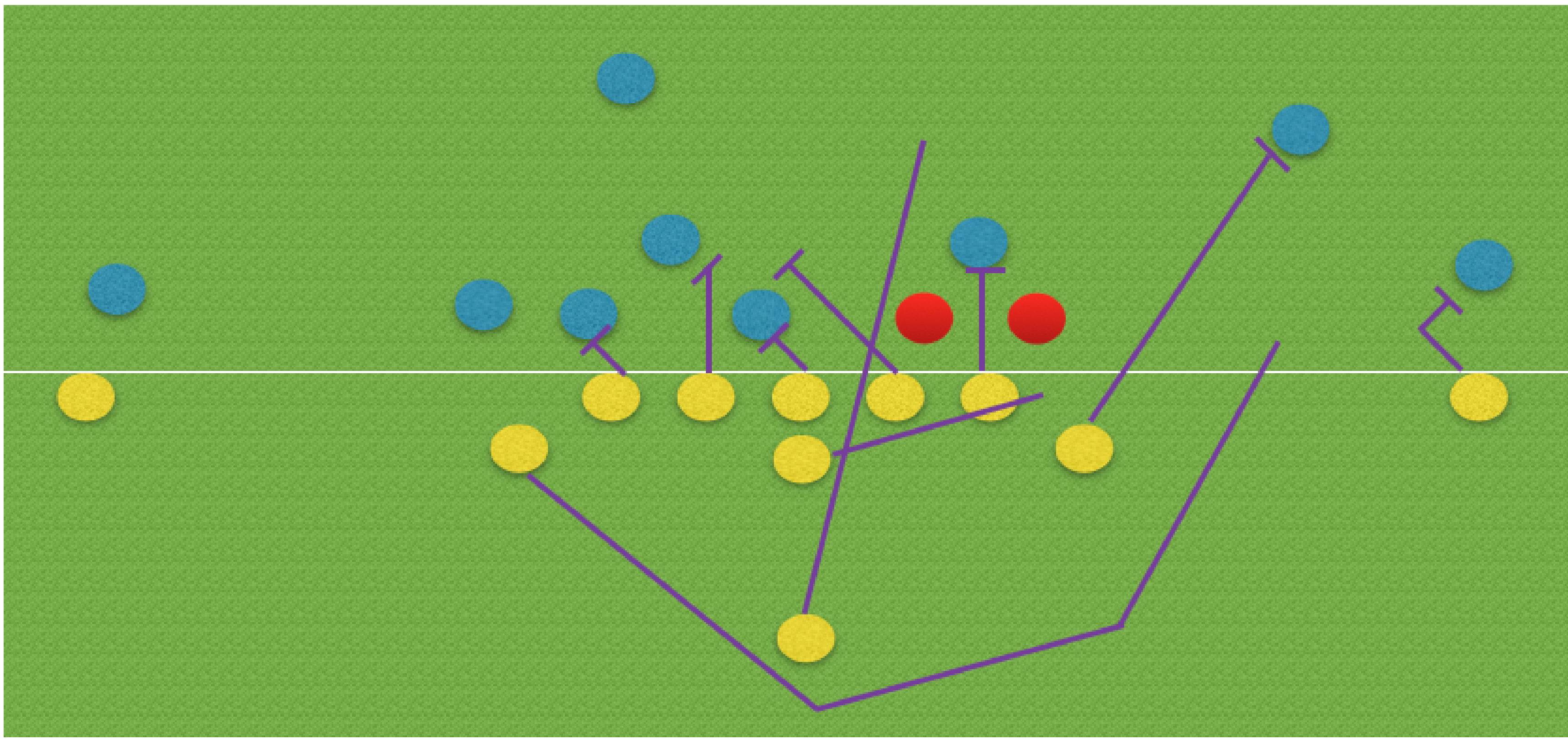
BNR
10 mg/l TN
1 mg/L TP

LOT
3 mg/l TN
0.05 mg/L TP

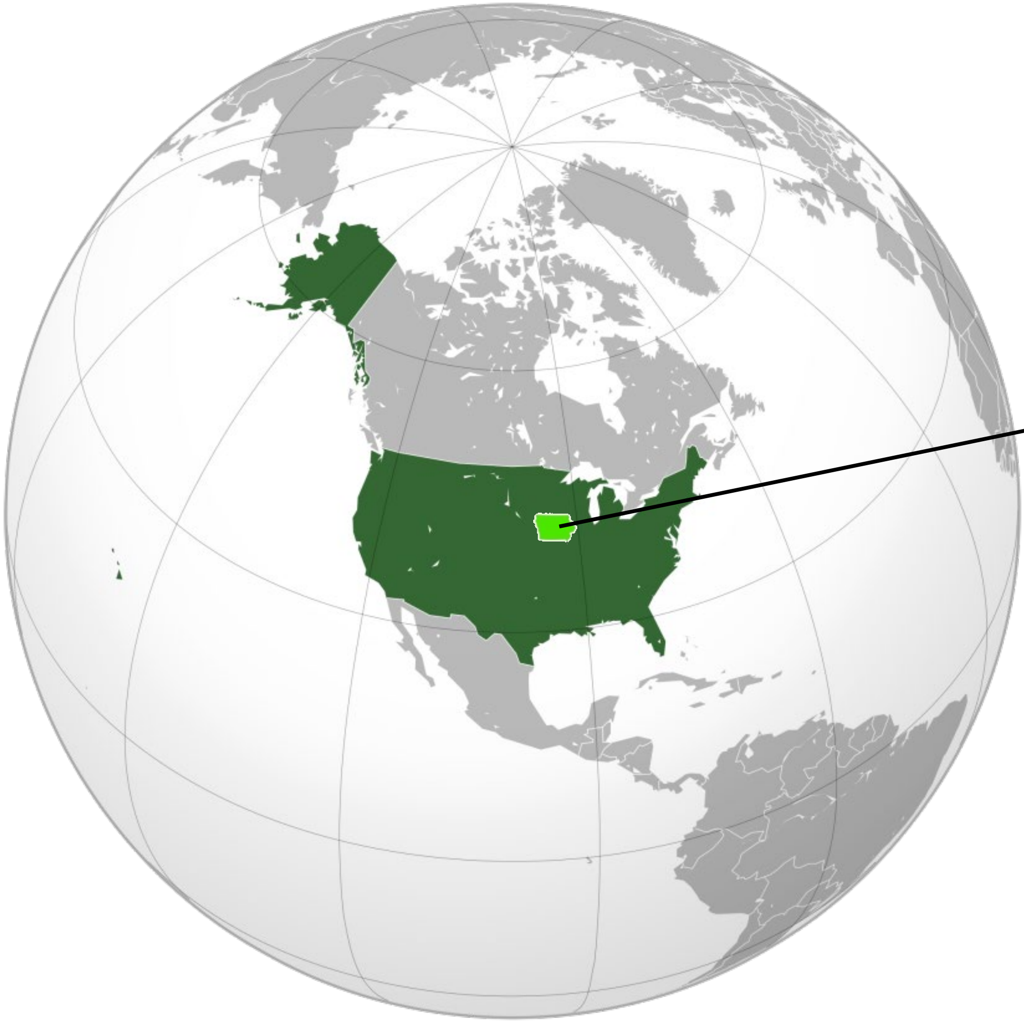
How do you get there?

- Each state is unique and facing different challenges
  - Geographically
  - Politically
  - Stakeholders
  - Supporting data
  - Legal structures

Different Playbooks Available



How can we reach the end game in the most efficient way possible?



United States
4.5% of World Population

Iowa
0.04% of World Population

Total Grain Production (Metric Tons)
Iowa – 55 Million
Canada – 45 Million

Total Soybean Production (Metric Tons)
China – 15 Million
Iowa – 14 Million

Why a performance or tech-based approach?

- 2006 – BIG $$$

- Excessive nutrients can cause water quality problems
  - In state , downstream

- Numeric nutrient criteria development presents challenging problems
  - Difficult to pin down cause & effect relationship
  - Difficult to comply with permit limits and costly to try
  - Possibly every water body impaired

- A different approach needed (IAWEA, ABI, & ILOC)

PS and NPS Common Threads

- Acknowledgement of the problem
- Recognition that traditional approaches are not workable (e.g. cost, technically)
- Willingness to want to do something now to make progress
- Needs to be practical in its implementation

Iowa's General Approach

1) Achieve nutrient load reductions through performance-based actions, while

2) Continuing to assess and evaluate the nutrient water quality standards

PS/NPS Collaboration

- PS account for 8% of the TN and 20% of the TP annually
- NPS account for 92% of the TN and 80% of the TP annually
- **Both NPS and PS play important roles on an annual and seasonal basis for Iowa water quality**

Point Source Strategy

- Working closely with CWA regulated community
- Use existing rules (Chapter 567 IAC Chapter 62)

  62.8(5) *Effluent limitations for pollutants not covered by effluent or pretreatment standards.* An effluent limitation on a pollutant not otherwise regulated under 62.3(455B) to 62.6(455B) (e.g., polybrominated biphenyls, PBBs) may be imposed on a case-by-case basis. Such limitation shall be based on effect of the pollutant in water and the feasibility and reasonableness of treating such pollutant.

- Use performance-based limits in lieu of nutrient criteria

Normal Permitting Process

Establish Effluent Limit → Establish Compliance Schedule → Construct Treatment → Meet Limits

Nutrient Strategy Permitting Process

Evaluate Existing Facility → Establish Construction Schedule → Construct Treatment → Optimize Treatment → Evaluate Treatment → Establish Effluent Limits

Implementation Flexibilities

– Regulatory certainty – 10 year assurance

– Affordability considerations

– Ability to fine tune limits

– Annual average mass permit limits

Who?

Focus on:

- **~100** major municipal wastewater treatment plants
- **~50** industries with biological treatment for process waste
- **Total of ~150**

Goal:

- To achieve BNR equivalent nutrient removal at each plant
  - **TN removal ~66%**
  - **TP removal ~75%**

Cost and Affordability

Estimated Costs for BNR Improvements for Muncipal Majors (Target Effluent TN = 10 mg/L, Target Effluent TP = 1 mg/L)										
Treatment Type	# of Facilities	Combined Design AWW Flow (MGD)	Combined Annual Average Flow[1] (MGD)	Total Capital Cost ($M)	Total Annual O&M Cost ($M)	Total Present Worth Cost ($M)[2]	Total Annual Cost ($M)	$/1,000 gallons Treated[3]	Weighted Monthly Cost/Household[4]	Weighted % of MHI[4]
Activated Sludge	56	533	355	348	25	686	51	0.39	7.75	0.18%
Fixed Film	37	101	67	430	7	524	39	1.59	25.83	0.73%
Aerated Lagoon	9	11	8	110	3	147	11	3.92	85.16	2.13%
Totals	102	645	430	887	35	1,358	101	0.64	11.85[5]	0.29%[5]

Estimated Costs for BNR Improvements for all Industries with Biological Treatment (Target Effluent TN = 10 mg/L, Target Effluent TP = 1 mg/L)							
Treatment Type	# of Facilities	Combined Design Flow (MGD)	Total Capital Cost ($M)	Total Annual O&M Cost ($M)	Total Present Worth Cost ($M)[1]	Total Annual Cost ($M)	$/1,000 gallons Treated[2]
Activated Sludge	20	44.2	29.3	2.0	56.1	4.2	0.26
Fixed Film	1	0.6	2.7	0.04	3.3	0.2	1.06
Aerated Lagoon	7	5.8	86.5	2.20	116.0	8.6	4.05
Totals	28	50.7	118.5	4.2	175.5	13.1	0.71

Total Present Worth Cost

= 1.53 ($B)

Total Capital Cost

= 1.00 ($B)

Gulf Restoration Network v. EPA

- Recent decision in December 2016

- **Upheld EPA denial petition for rulemaking to establish numeric nutrient criteria for states within the Mississippi basin**

- Court found that "the most effective and sustainable way to address widespread and pervasive nutrient pollution in the Mississippi-Atchafalaya River Basin and elsewhere would be to build on its earlier efforts and to continue to work cooperatively with states and tribes to strengthen nutrient management programs" is a valid legal basis to decline to make a necessity determination

- Court also noted that the use of nutrient reduction frameworks **may only buy EPA so much time** if they can't prove they're working

Iowa Point Source Monitoring

September 2013

ZERO facilities sampling, NRS based off of engineering assumptions

~5 years

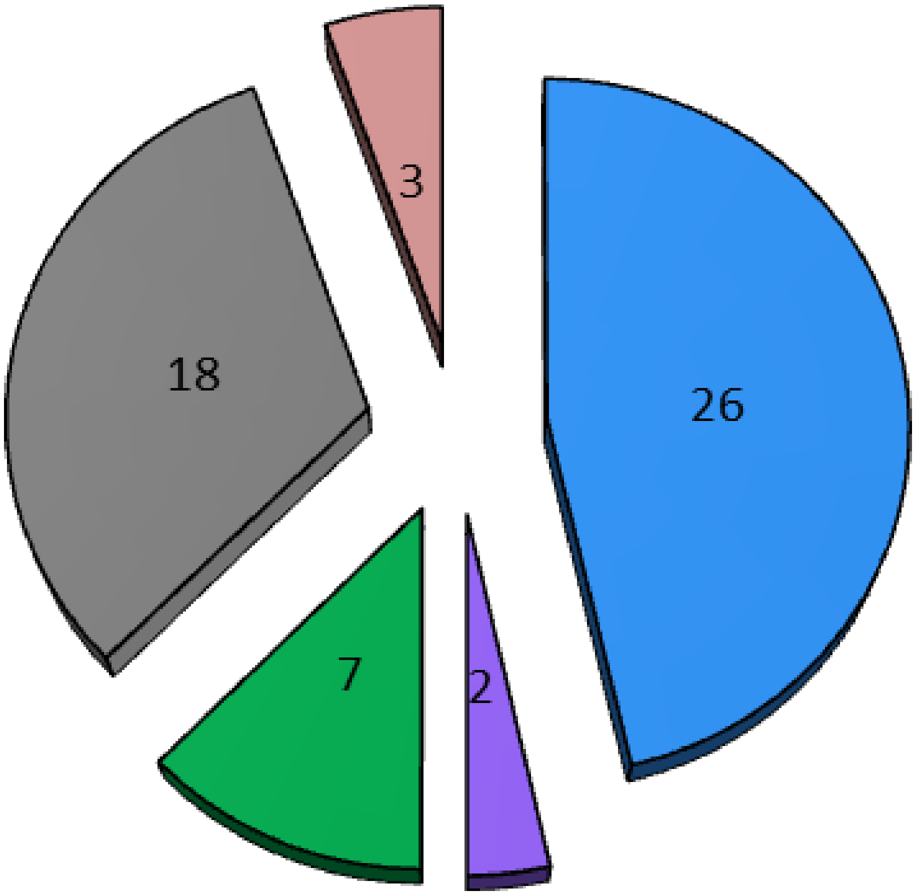
November 2019

143 facilities X 4 samples/wk X 52 weeks
=
~30,000 samples annually

(approximately $1,000,000 annually)

Treatment Type	No.	Total Nitrogen			Total Phosphorus		
		Raw (mg/L)	Final (mg/L)	%R (lbs/d)	Raw (mg/l)	Final (mg/L)	%R (lbs/d)
POTW	72						
Activated Sludge	29	39.3	20.6	45.1%	7.9	4.0	49.8%
Aerated Lagoon	3	27.9	12.3	48.8%	5.2	2.7	41.4%
Oxidation Ditch	1	25.8	22.5	11.6%	4.4	3.2	28.0%
Rotating Biological Contactor	6	22.7	12.5	40.5%	3.8	2.9	20.6%
Sequencing Batch Reactor	10	33.3	12.9	65.6%	6.3	3.2	52.5%
Trickling Filter	23	33.9	19.8	35.2%	6.1	4.4	27.6%
Industry	TN-15, TP-21						
Activated Sludge	TN-10, TP-16	59.5	15.5	68.7%	21.7	9.1	34.0%
Aerated Lagoon	2	149.6	21.3	86.8%	19.8	5.2	75.7%
Oxidation Ditch	1	223.7	94.7	57.6%	39.9	31.0	22.5%
Rotating Biological Contactor	0	-	-	-	-	-	-
Sequencing Batch Reactor	2	136.2	13.2	91.6%	62.5	48.9	37.6%
Trickling Filter	0	-	-	-	-	-	-

Nitrogen Municipal Commitments From Feasibility Studies

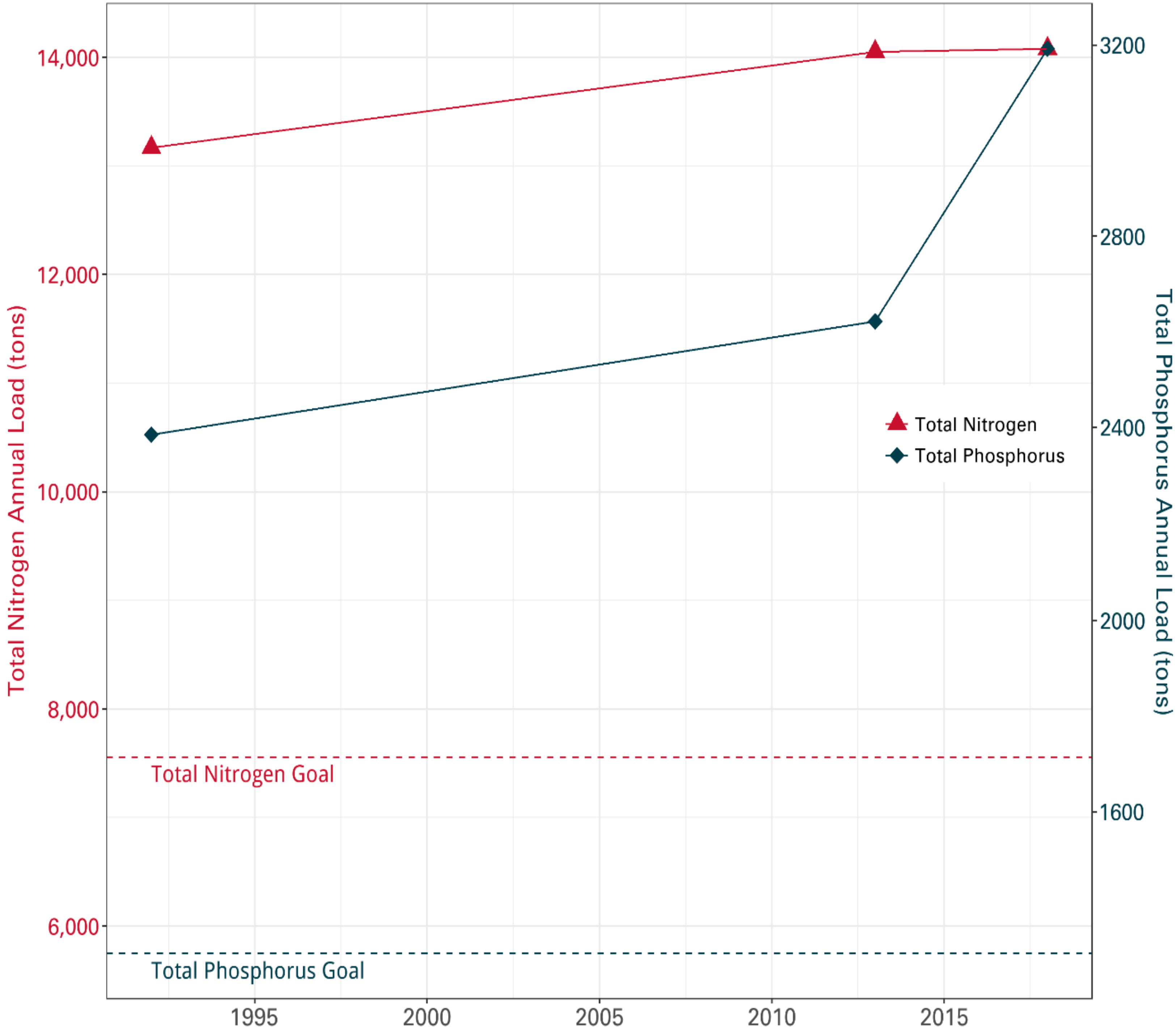


Total Feasibility Studies Submitted: 44

Total Permits Amended: 25

Municipal Phosphorus Data Through April 2017

			Phosphorus Raw Waste Data				Phosphorus Final Effluent Data				Phosphorus % removal		Average lbs of P removed
			conc (mg/l)	mass (lbs/day)			conc (mg/l)	mass (lbs/day)					
avg conc % remvl	Facility Name	Treat Type	Avg mg/l	Avg lbs/d	Sum of raw lbs/d data	Est. Avg raw lbs in 1 year	Avg mg/l	Avg lbs/d	Sum of final lbs/d data	Est. Avg lbs discharged in 1 year	Avg conc mg/l	Avg mass lbs/d	Est. lbs removed in 1 year (avg raw-avg final)
1	CARROLL	ACT SLUDG	4.1	62.4	250	22,767	0.3	3.8	99	1,390	**92.0%**	**93.9%**	21,377
2	WEST LIBERTY	ACT SLUDG	5.0	60.6	8,417	22,102	1.0	11.8	1,641	4,309	**80.8%**	**80.5%**	17,793
3	CORALVILLE	SBR	5.5	129.4	12,945	47,249	1.1	24.1	2,406	8,783	**80.1%**	**81.4%**	38,466
4	IOWA CITY SOUTH	ACT SLUDG	5.8	453.6	112,937	165,550	1.2	99.6	24,795	36,346	**79.2%**	**78.0%**	129,204
5	MOUNT VERNON	ACT SLUDG	7.0	23.9	2,531	8,714	1.5	5.2	549	1,890	**79.1%**	**78.3%**	6,824
6	SIOUX CITY	ACT SLUDG	18.4	1865.6	203,346	680,930	4.3	470.5	51,284	171,731	**76.4%**	**74.8%**	509,199


Total Nitrogen Annual Load (tons)
14,000
12,000
10,000
8,000
6,000
Total Phosphorus Annual Load (tons)
3200
2800
2400
2000
1600
1995
2000
2005
2010
2015
Total Nitrogen
Total Phosphorus
Total Nitrogen Goal
Total Phosphorus Goal

Things I'm Excited About!!!

- POTW Survey
- Nsmart
- Iowa's City and Industrial interest in watershed investments
- ACWA's Nutrient Progress Tracker

What questions do you have?