

How Water Quality Standards Affect Permitting for Small Systems

ACWA/EPA 2019 Nutrients Permitting Workshop

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November 6, 2019

Background/Issues

Discussion raised in Boise December 2017

- Increasing pressure to adopt Numeric Nutrient Criteria (NNC)
 - This may disproportionately affect POTWs, particularly small POTWs
- The majority of POTWs serve a population where construction and O&M of nutrient reduction technologies may be unaffordable (e.g. <3000)
 - Large number of dischargers, small fraction of the permitted discharge flow
- Nutrient reduction strategies remain a high priority for ACWA, states, EPA, environmental NGOs, and municipalities
- Are variances for perhaps half or more of POTWs a reasonable solution?
- How can the NPDES program best accommodate nutrient reduction?

The small group that brought up issue in Boise has met informally

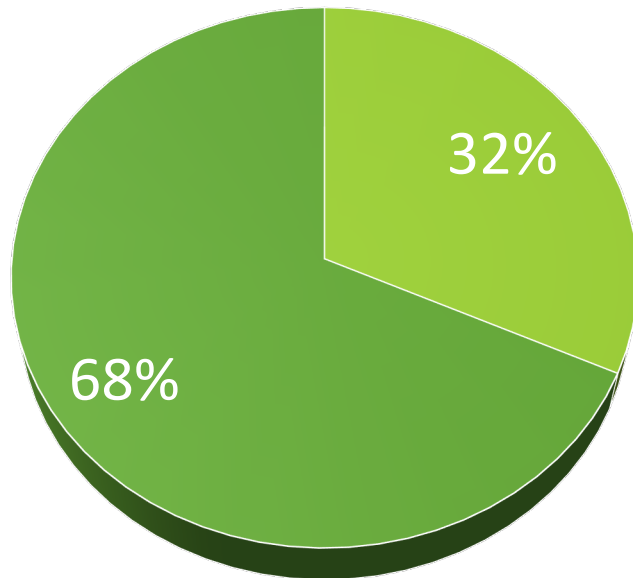
- Debated the issue a little more/kicked around some ideas

Continued to discuss small communities at subsequent workshops

- Columbus – Small Systems
- Gulfport – Small Systems and TMDLs

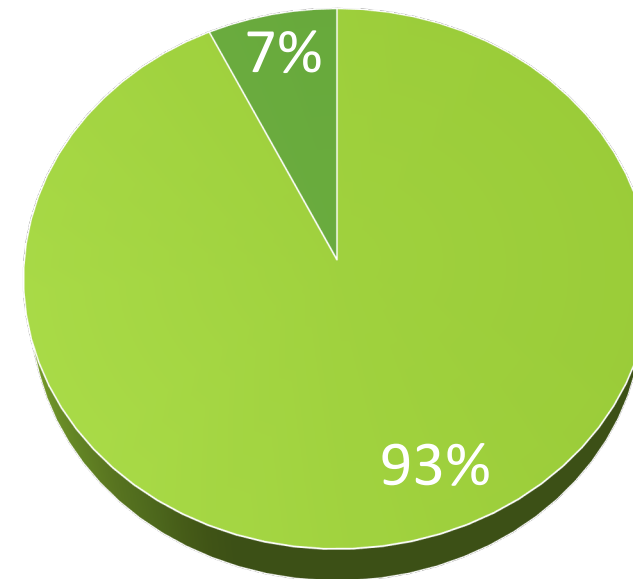
Large and Small Communities

Percentage of US Cities by Population



■ Pop >3000 ■ Pop <=3000

Percentage of US Population by City Size

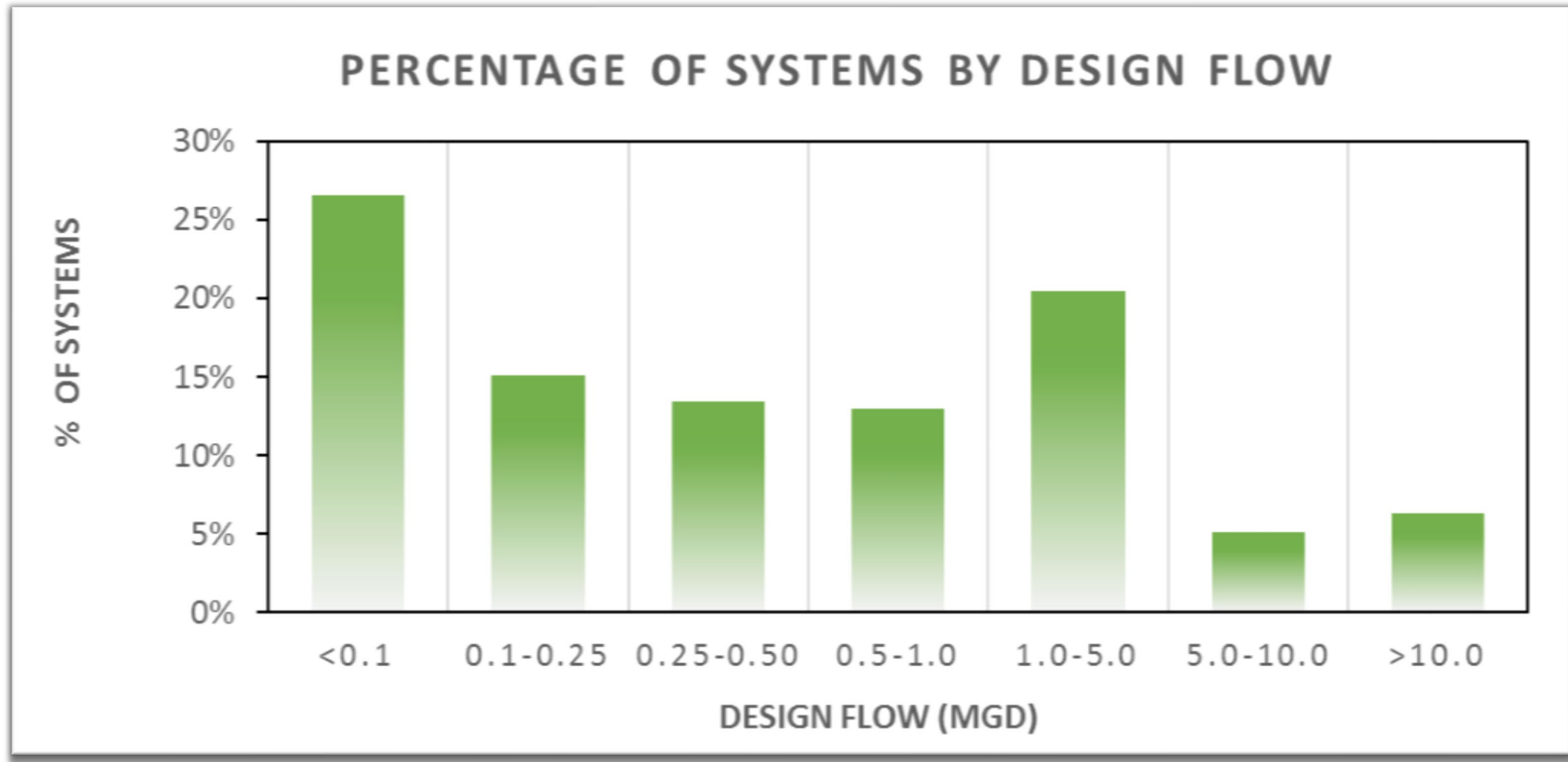


■ Pop >3000 ■ Pop <=3000

Based on 2010
Census Data

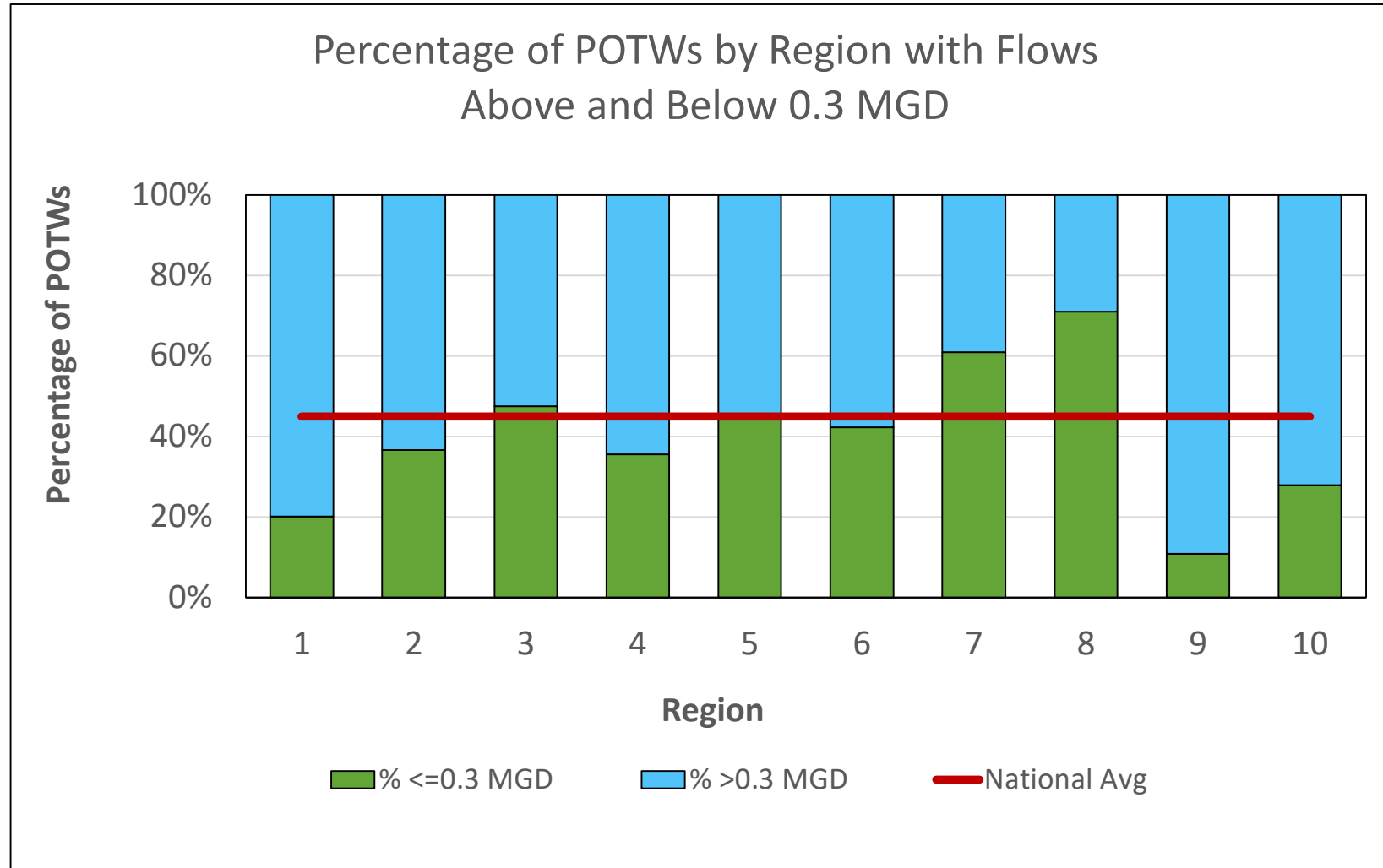
7% of US Population Lives in 2/3 of our Communities

Large and Small POTWs



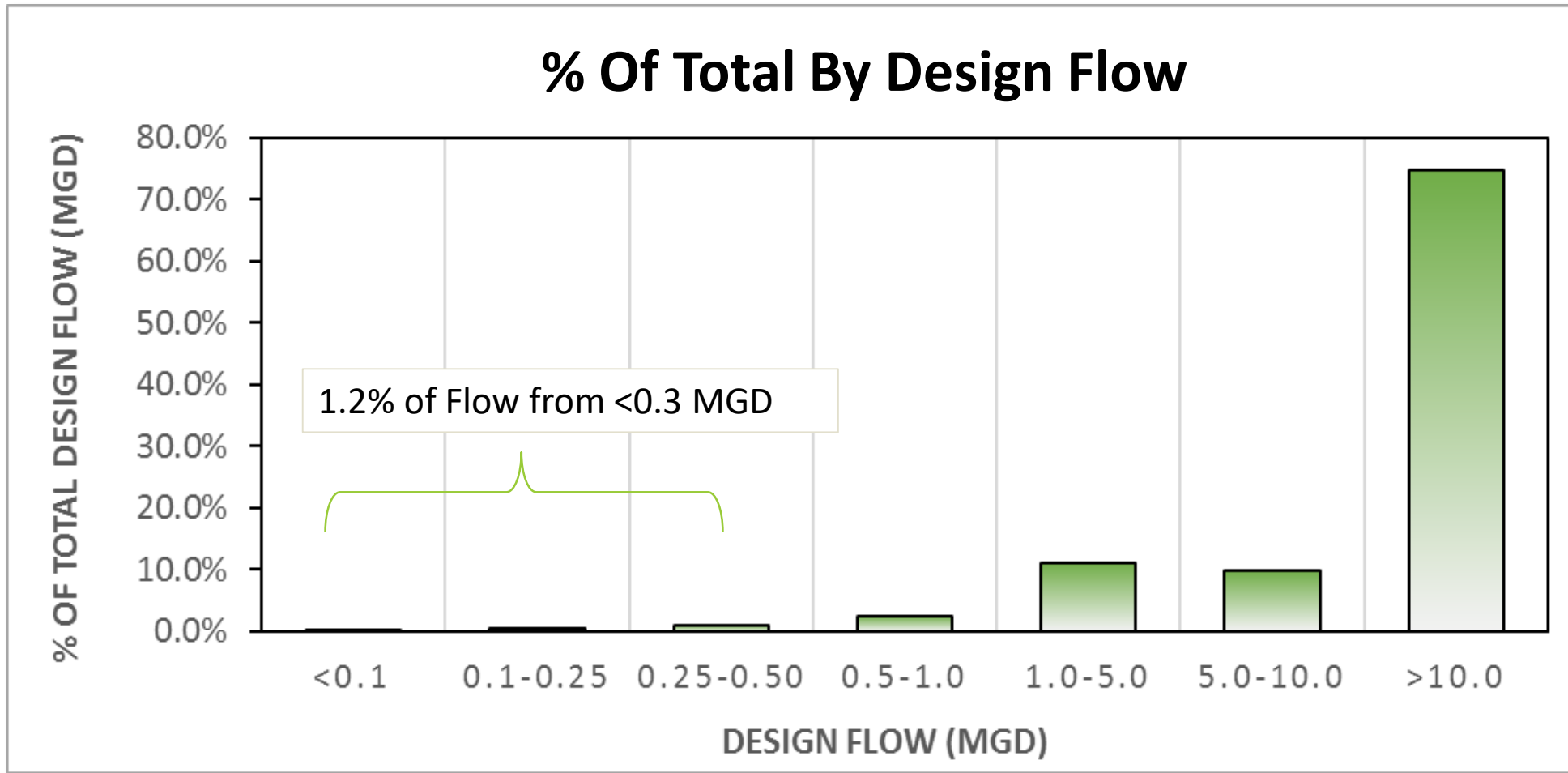
Based on ICIS
Data

Large and Small POTWs



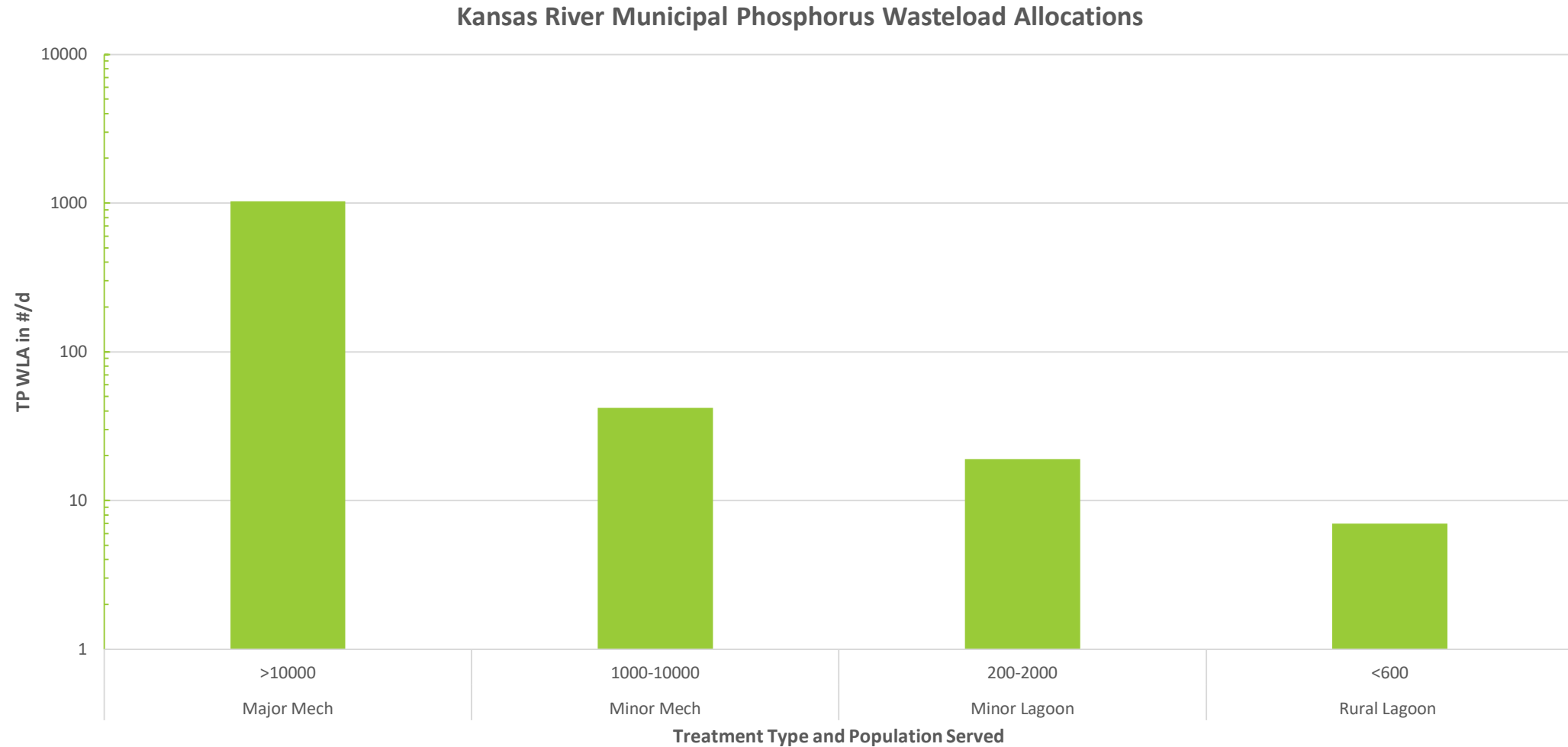
**Based on ICIS
Data**

Large and Small POTWs



Based on ICIS
Data

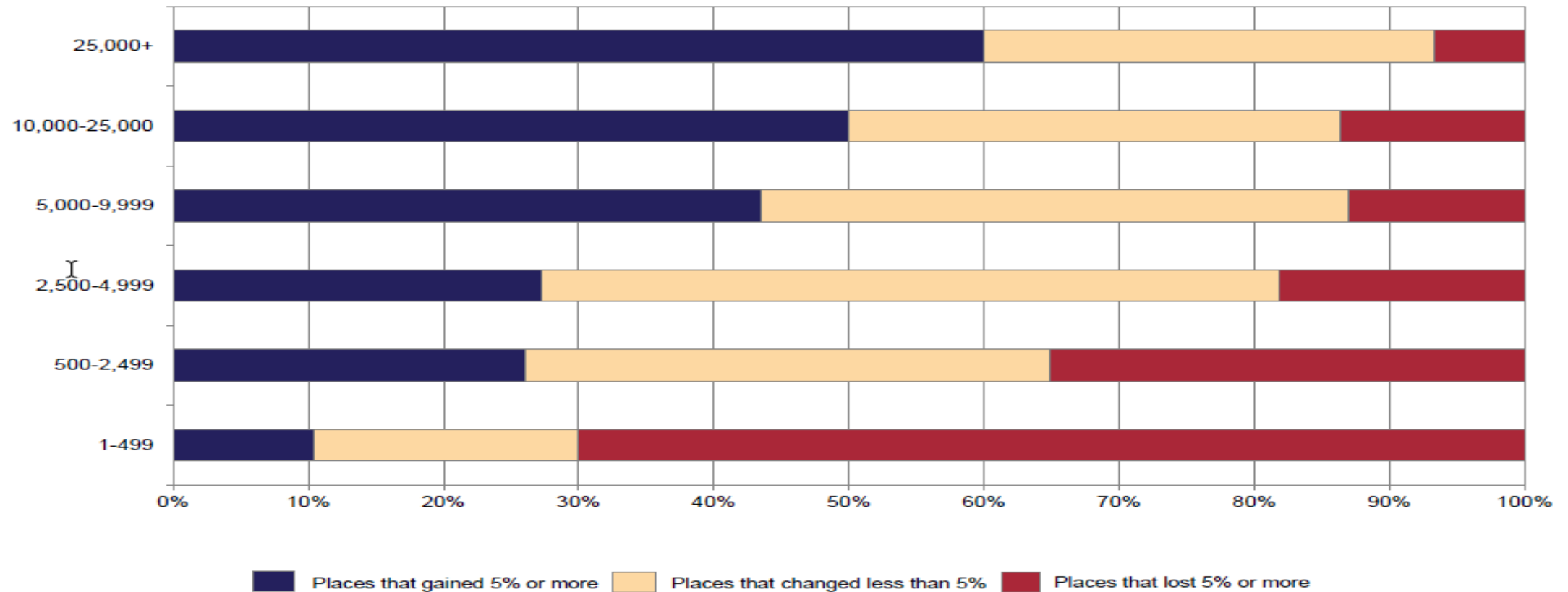
Wasteloads = f(Treatment Type, Population)



Rural Flight is Real in Kansas

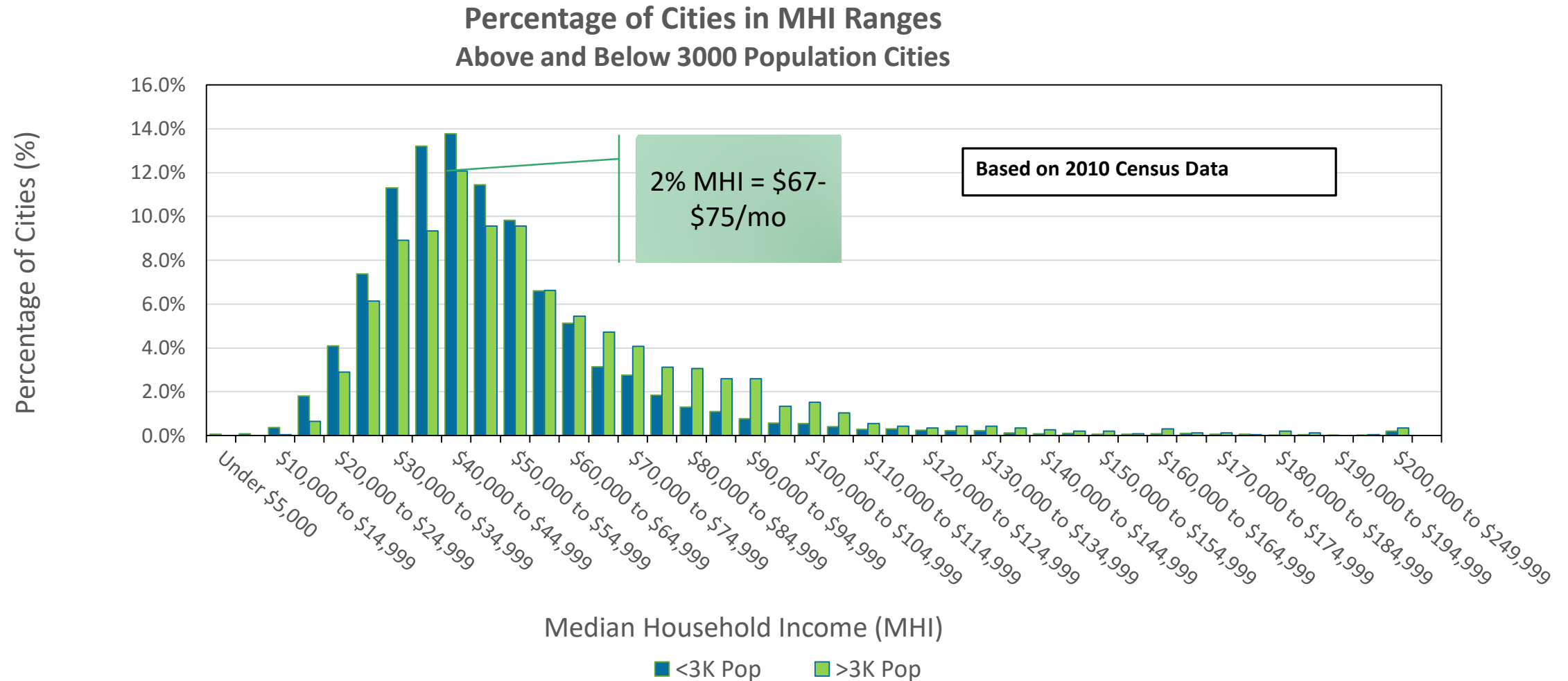
Population Change in Kansas, by Size of Place, 2000-2010

Population of Place in 2010



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

Income and Small Communities



Income and Small Communities

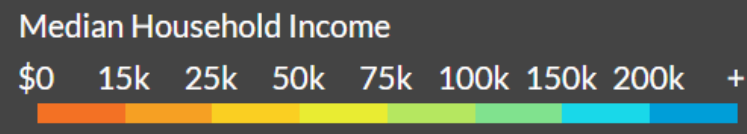
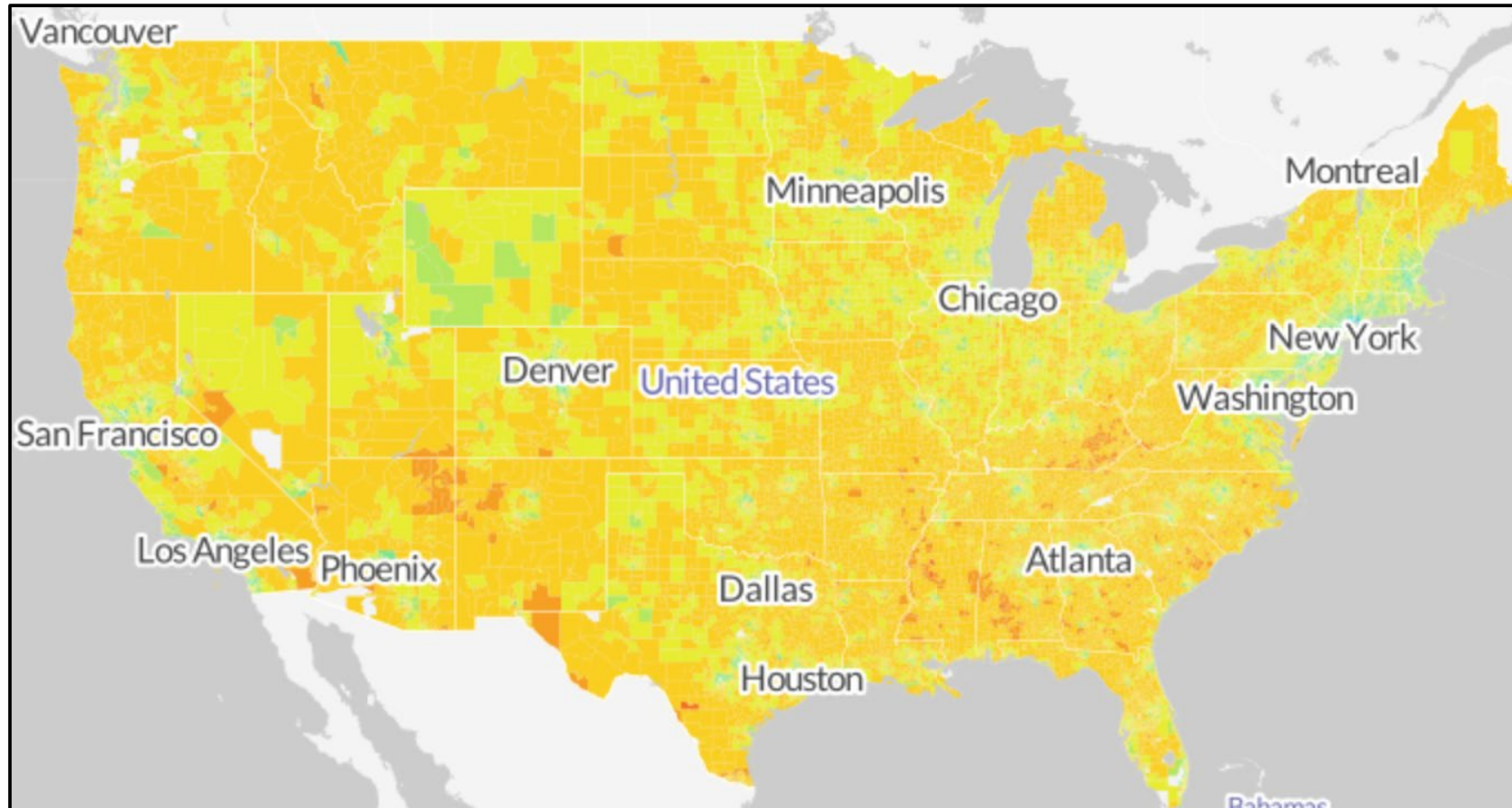
Latest year Census data available – 2017

Metric	Nationwide	Region 7
MHI	\$57,652	\$54,145
% 3,000 Pop Communities w/MHI < Nationwide MHI	72%	82%
Median of MHIs For <3,000 Population Communities	\$45,833	\$44,583

What this tells me

- Use caution with national/regional generalizations
 - Data can be skewed upward due to higher incomes in populous areas

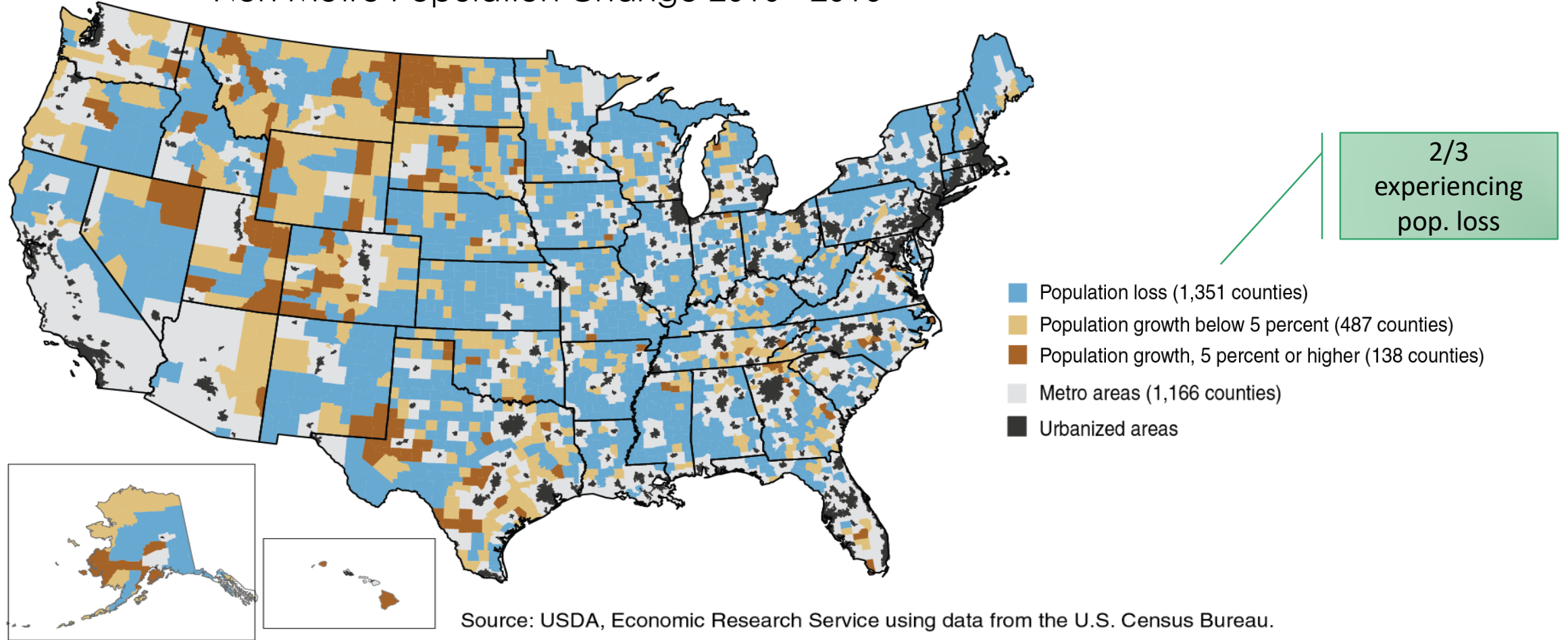
MHI Distribution



WNYC – New York Public Radio

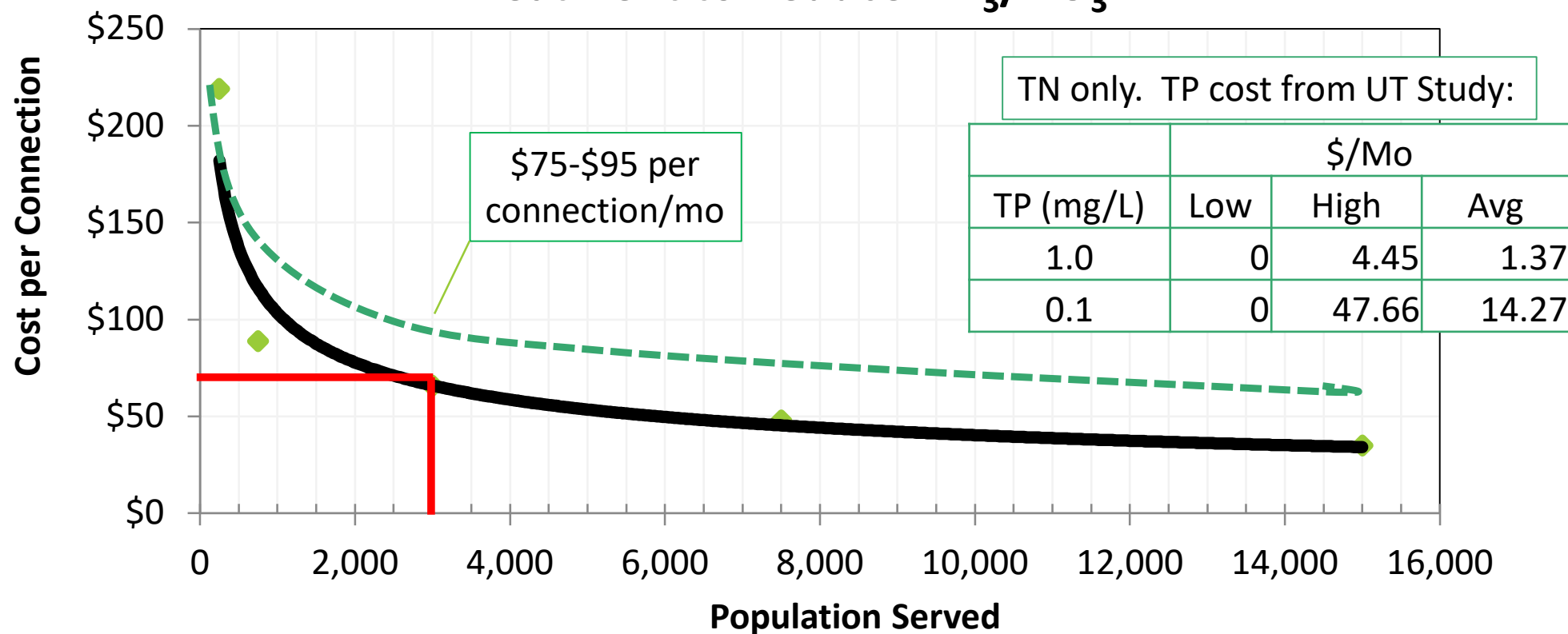
Rural/Metro Demographics

Non-Metro Population Change 2010 - 2016



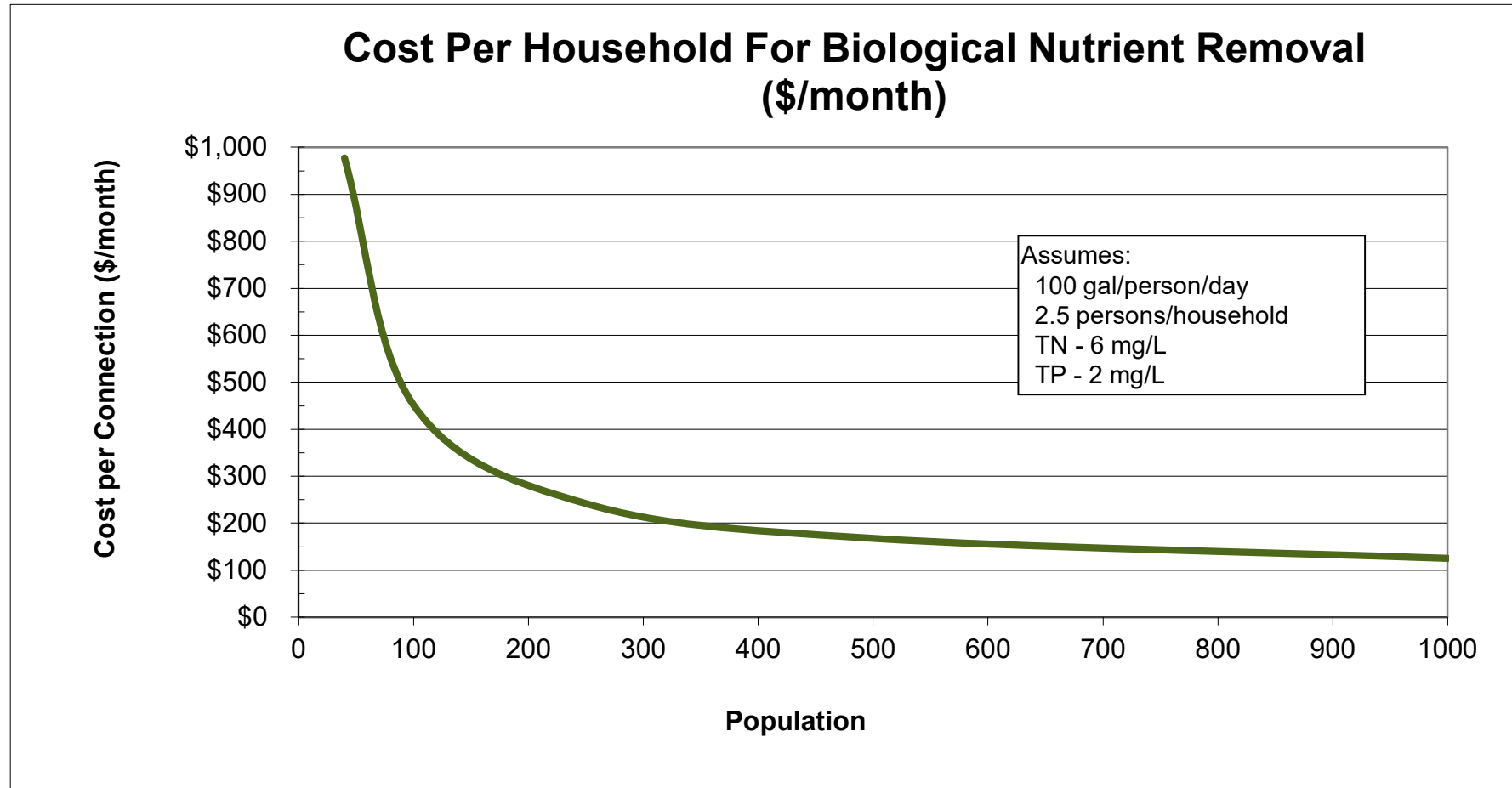
Costs and Small Communities

Facultative Lagoon Replacement Cost for Mechanical Treatment to Reduce NH₃/NO₃



TetraTech/KDHE/UT

Costs and Small Communities

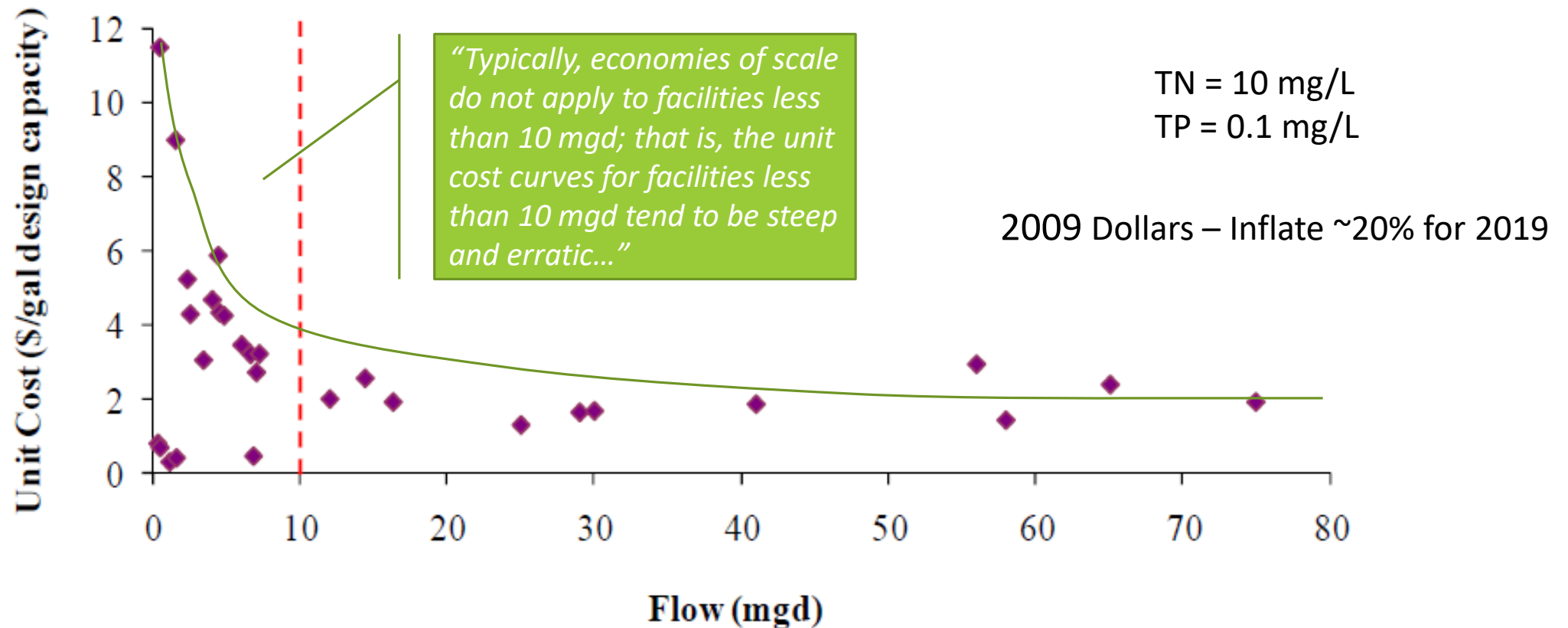


FWPCA (inflation adjusted)

Costs and Small Communities - UT Statewide Study

FIGURE 22

Upgrade Unit Capital Cost of Individual POTWs in Dollars per Gallon of Design Capacity to Achieve Tier 1N Level of Nutrient Control



Costs and Small Communities – EPA Report

A Compilation of Cost Data Associated with the Impacts and Control of Nutrient Pollution

- 2015 Report
- Evaluated costs of 370 WWTF nutrient upgrades/new builds – not much in small system size
 - 43 <1.0 MGD (11.6%)
 - 10 <0.4 MGD (2.7%)
 - None of 10 were designed to remove both TN and TP
 - No design effluent concentrations provided, only effluent concentrations
 - Average/Median effluent concentrations (mg/L)
 - TN – 8/8
 - TP – 2.5/2.2
- Range of cost for Capital and O&M where provided
 - 2012 - \$2.58 – \$116.08/mo/ratepayer @ 0.3 MGD (~3000 population)
 - 2019 - \$2.92 – \$131.17/mo/ratepayer @ 0.3 MGD (~3000 population)*

*Used Dept of Labor CPI calculator to bring to 2019 \$

Costs and Small Communities – KS Data

Required all **major** POTWs to cost out

- BNR – TN – 8.0 mg/L TP – 1.5 mg/L
- ENR – TN – 5.0 mg/L TP – 0.5 mg/L
- LOT – TN – 3.0 mg/L TP – 0.1 mg/L

Capital costs only

Cost \$/gal (2018 \$)			
Statistic	BNR	ENR	LOT
Average	4.79	6.16	6.81
Median	4.26	5.41	5.44
Minimum	0.12	0.13	1.09
Maximum	12.20	12.81	15.95

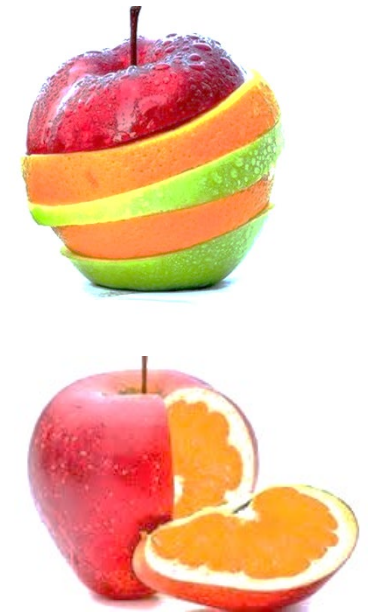
Assume:

- \$4.75/gallon Capital
 - 3% interest rate
- \$5.00/gallon O&M
- 3,000 population
- 1,200 rate payers
- Rate payer cost - \$41/mo

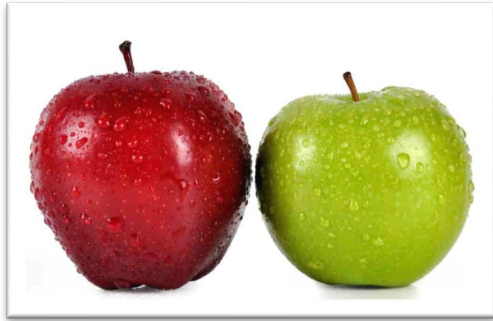
What Do the Data Tell Us?

Assuming 3,000 Population

Study	Cost (\$/mo/ratepayer)		MHI Supported @ 2% MHI	
	Low	High	Low	High
TetraTech/KDHE/UT	\$75	\$95	\$45,000	\$57,000
FWPCA	\$55	\$55	\$33,000	\$33,000
UT (<10 MGD)	\$12	\$112	\$7,200	\$67,200
EPA (<0.4 MGD)	\$3	\$116	\$1,800	\$69,600
KDHE	\$41	\$41	\$24,600	\$24,600



What Do the Data Tell Us?



Study	Cost (\$/mo/ratepayer)		MHI Supported @ 2% MHI	
	Low	High	Low	High
TetraTech/KDHE/UT (1,000 Pop)	\$100	\$130	\$60,000	\$78,000
FWPCA (1,000 Population)	\$125	\$125	\$75,000	\$75,000

Is % MHI Even the Right Threshold?

Many argue it is a poor indicator

- Congress and NGOs pressing for different affordability tests

Manny Teodoro, PhD at Texas A&M proposes a new threshold

- Affordability Ratio at 20th percentile income – AR_{20}
- Many social scientists say
 - Low income - < 20th percentile
 - Middle income – 20th to 80th percentile
 - High income - >80th percentile
- Proposal – lowest middle income should set affordability threshold – e.g. 20th percentile
- Subtract non-water essential costs from 20th percentile income = disposable income
- $Water\ Bill \div Disposable\ Income = AR_{20}$
- Teodoro proposes AR_{20} should not exceed 10% of disposable income



Example of AR₂₀ – Topeka, KS Family of 4

Non-Water Essential Costs	A	Basic Water vol. (gal/mo)	6,000	
	B	Drinking Water Bill (\$/mo)	\$35	Topeka Rate for 6000 gal/mo
	C	Wastewater Bill (\$/mo)	\$41	Topeka Rate for 6000 gal/mo
	D	Community's 20th %ile Household Income (\$/mo)	\$1,729	US Census Bureau (\$20,748 annual)
	E	Taxes (\$/mo)	\$200	KS and Fed Income Tax Tables
	F	Housing (\$/mo)	\$425	Subsidized Housing Topeka Housing Authority
	G	Healthcare (\$/mo)	\$100	Subsidized Healthcare
	H	Food (\$/mo)	\$668	USDA Low Cost Plan (\$5.57/person/day)
	I	Home Energy (\$/mo)	\$100	State Average
	J	Transportation (\$/mo)	\$100	4 Reduced Fare Bus Passes
	K	Childcare (\$/mo)	\$0	
	L	Telecom (\$/mo)	\$35	Basic Sprint Plan
	M	Non-Water Essential Costs (\$/mo) - (Σ E:L)	\$1,628	
	N	Disposable Income - (D-M)	\$101	
	O	AR20 - ([B+C]/N)	75%	25 Major City Study - 4.8% to 26.9% with Avg = 11.4%

Summary

Small community challenges

- Low population = low rate base
 - Economy of scale works against small communities
 - Capital and O&M is a struggle
- Population shrinkage
 - Loss of rate payers = automatic rate increase for remaining ratepayers
 - Dividing fixed costs over a smaller base
- What does treatment really cost?
 - Need a comprehensive analysis of treatment process/cost for small populations
- Affordability metrics
 - Do our current metrics work?
 - Are our current metrics equitable?

How Do We Address?

1. Balance demands placed on Municipal investment
 - Wastewater and drinking water both need to be considered
 - SDWA requirements are escalating and independent of scale, i.e., Hoxie, KS = Honolulu, HI
 - Promote Integrated Planning – Play the long game
2. Regionalize if possible – increase ratepayer base
 - Improves economy of scale issues
 - Can be impractical in larger, sparsely populated states
 - Large sociologic barrier exists
3. Optimize
 - Works well for activated sludge processes – TF, RBC, lagoons generally not as effective
 - What do we do to incorporate “*optimized*” limits into permits?
 - Annual limits?
 - Recognize nutrients not an acute problem
 - Therefore, impacts are directly a function of duration, sometimes independent of magnitude
 - Recognize potentially higher variability of effluent from plants not necessarily designed for BNR?
 - Recognize seasonal impacts?

How Do We Address? Contd.

4. Tech-based limits

- What universe?
 - Size?
 - Treatment type?
 - Both?
 - In TMDL?
- How do we justify cost to go part way to WQBEL? Our economic docs focus on WQBEL.

5. TMDL – lots of room to play with mass limits; consistent with WLAs

6. Variance

- Individual variance
- Multi-discharger variance
- National discharger variance?

7. Let's talk about WQ Trading

8. Triage based on situation and proportion

9. Mix and match

10. Other Ideas??