

# **The Trinity River Past, Present, and (most importantly) Future**



**By**

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# UPPER TRINITY WATER QUALITY COMPACT

- **When:** Formed 1975
- **Who:** Dallas, Fort Worth, Trinity River Authority, North Texas Municipal Water District
- **What:** Address water quality issues through monitoring, studies, and working with the state to develop positive approaches to regulatory requirements

# TRINITY RIVER PAST

## 1925 Texas State Health Department report on the Trinity River,

“A stench from its inky surface  
putrescent with the oxidizing  
processes to which the shadows  
of overarching trees add Stygian  
blackness and the suggestion of  
some mythological river of  
death. ...A thing of beauty is  
thus transformed into one of  
hideous danger.”



# TRINITY RIVER PRESENT



Trinity Overlook Park - Dallas



Trinity Park – Fort Worth

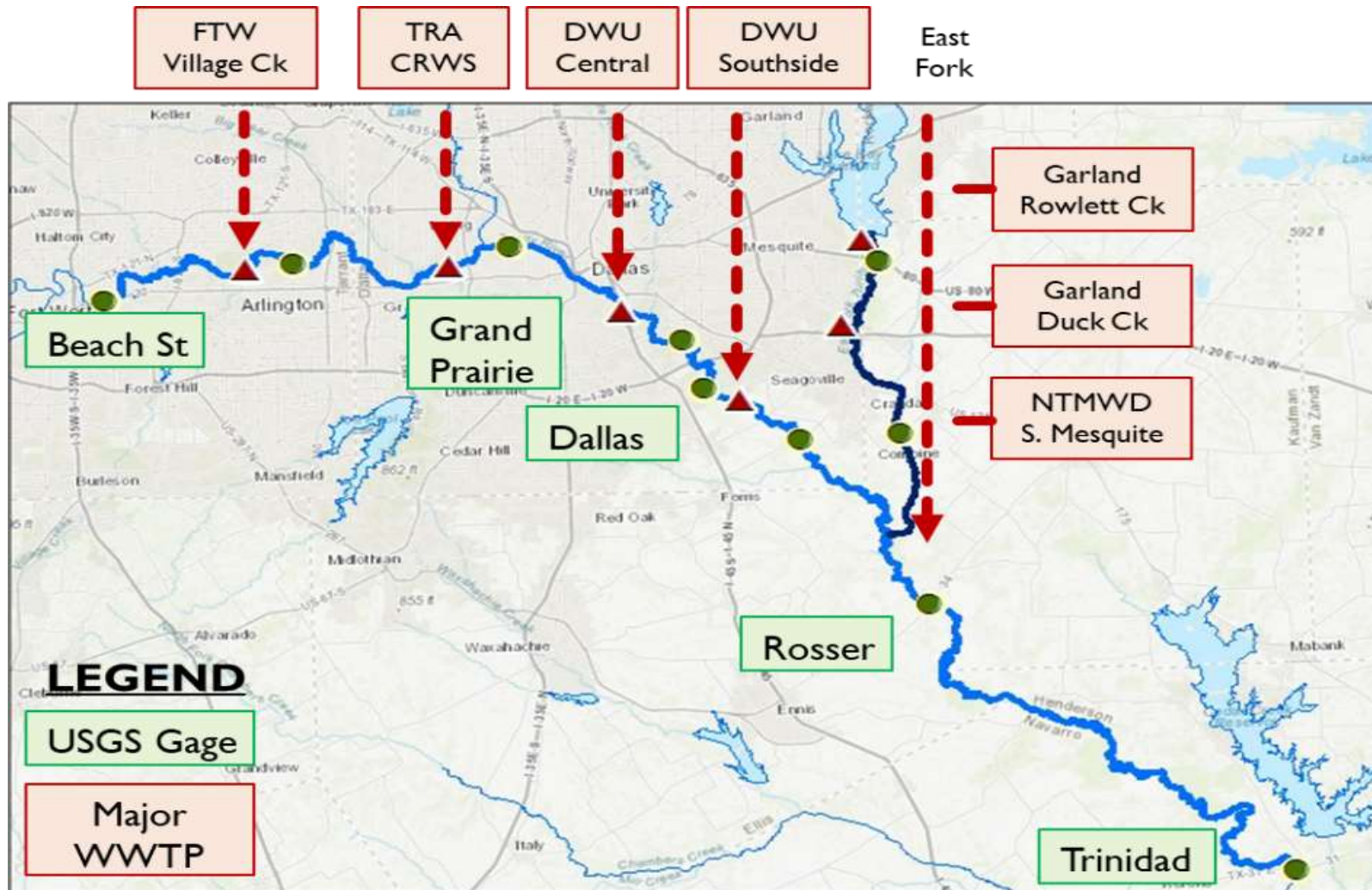
## TRINITY RIVER - FUTURE

- **Increasing emphasis on control of nutrients (nitrogen and phosphorous) at Federal and State level.**
- **Upper Trinity River is effluent - dominated**

**ARE PERMIT LIMITS FOR PHOSPHORUS  
IN THE FUTURE OF METROPLEX  
DISCHARGERS AND, IF SO, AT WHAT  
LEVEL?**



# STUDY AREA



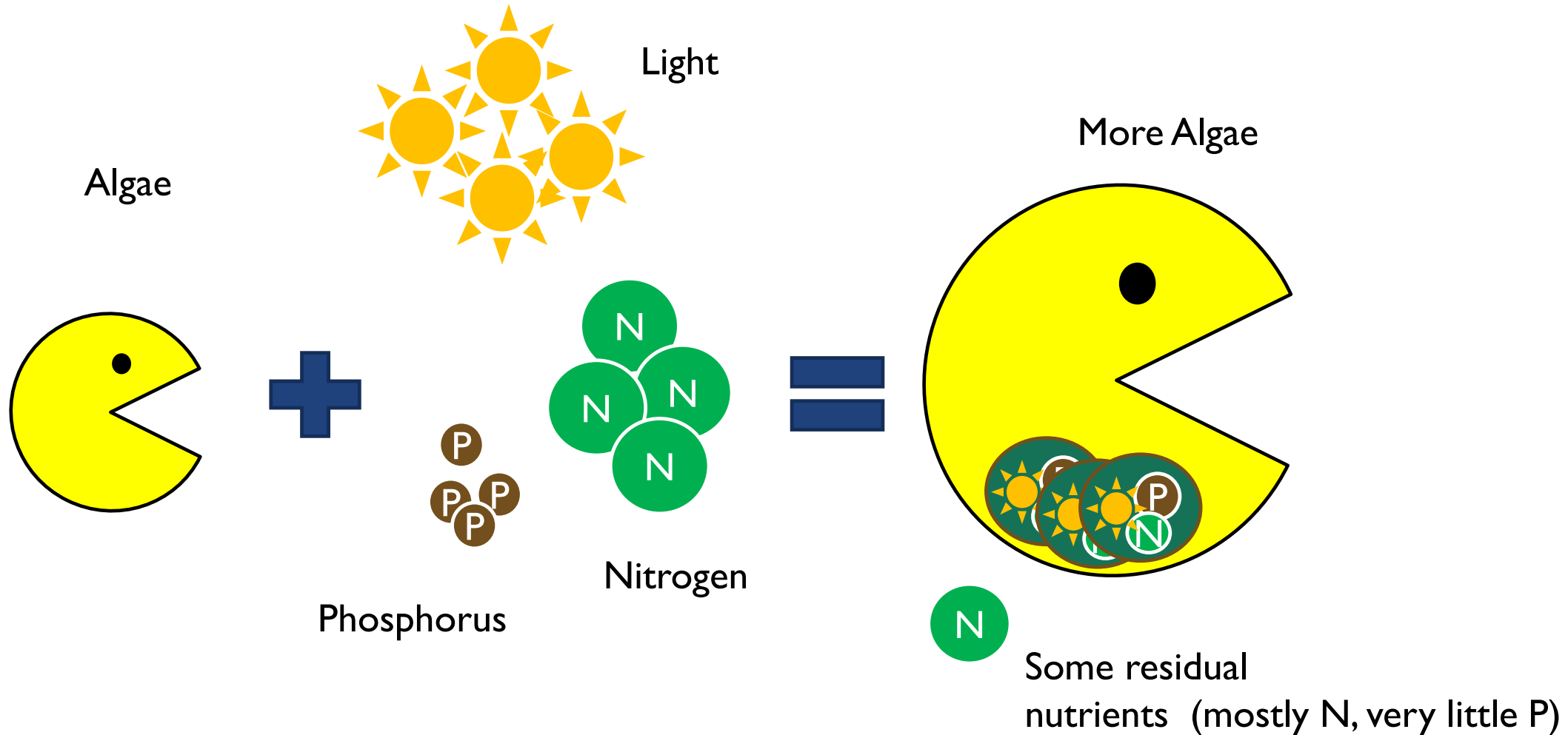
# STUDY OVERVIEW



## Develop Nutrient Model

- **Conduct Two Intensive Surveys During Low Flow**
- **Transfer WLA Hydraulics to QUAL-2K**
- **Calibrate and Verify QUAL-2K Quality Outputs**

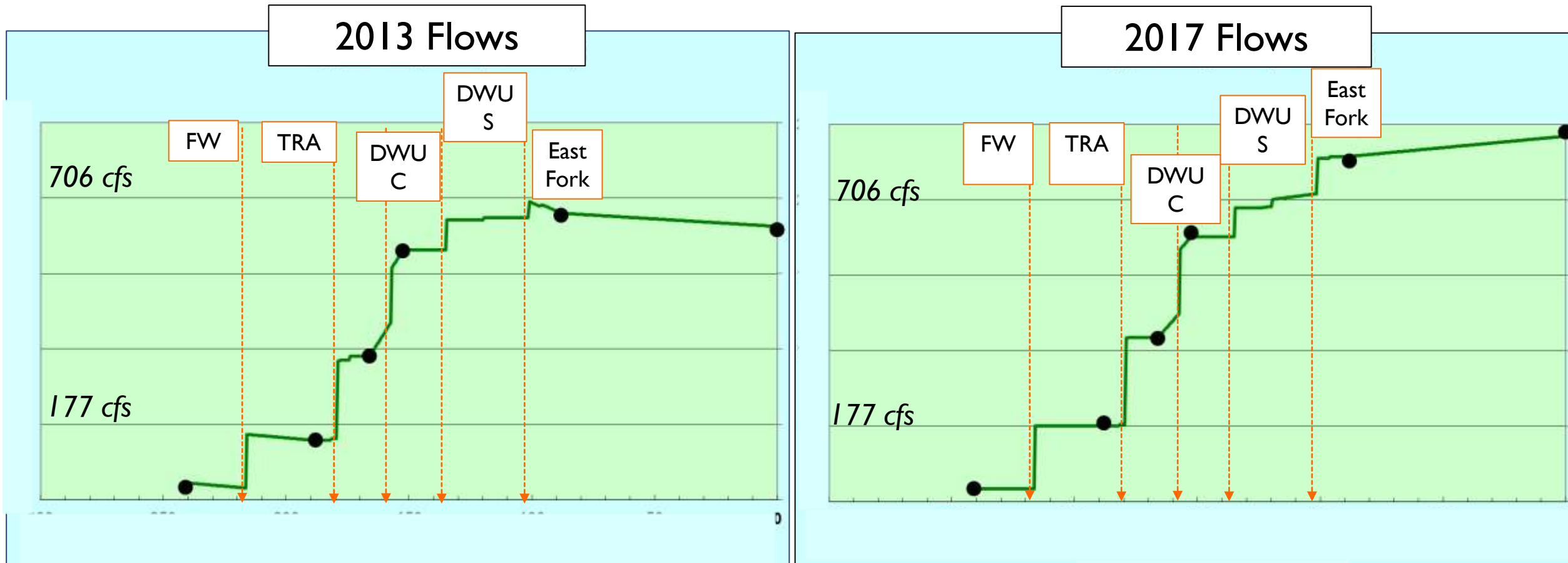
# ALGAL GROWTH



***Freshwater systems are typically phosphorus-limited, but not all.***

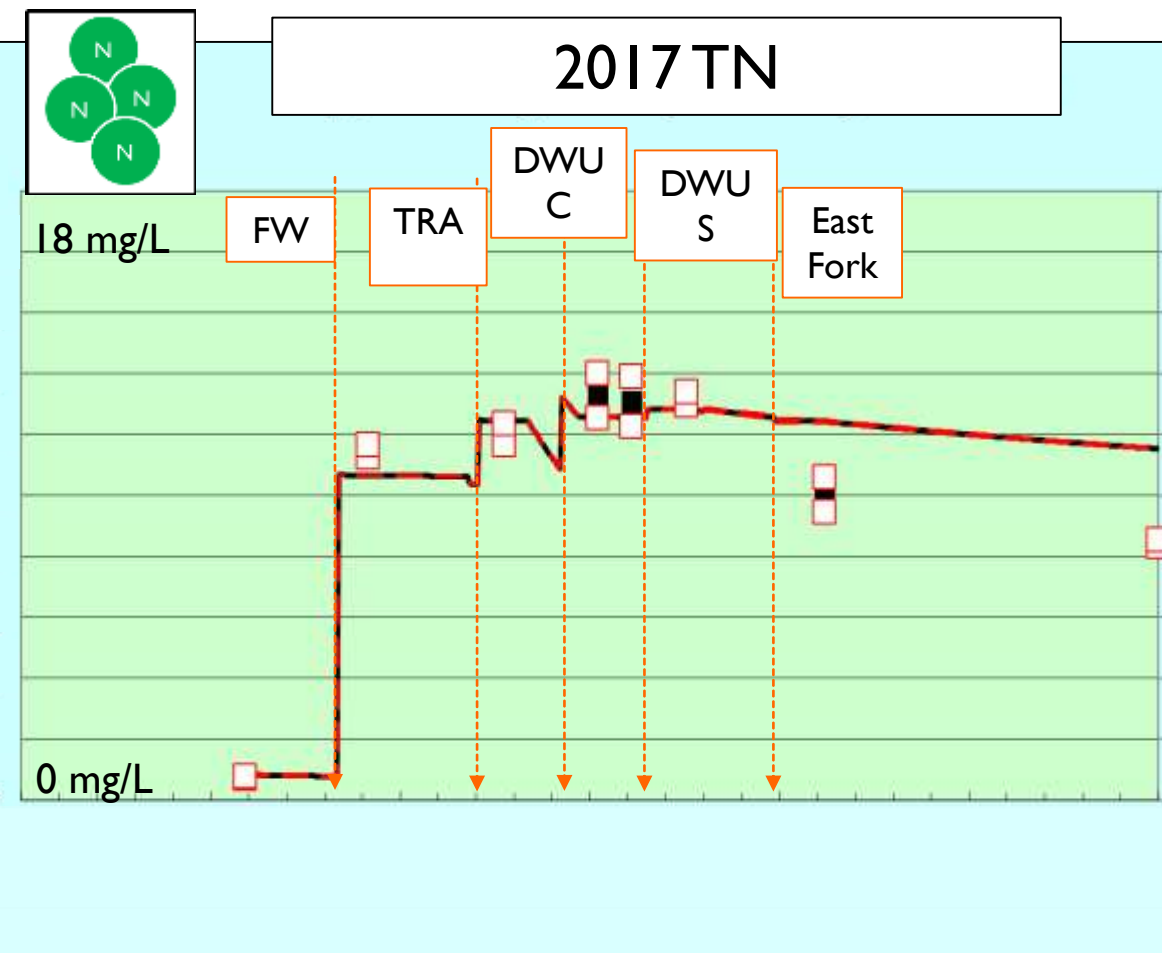
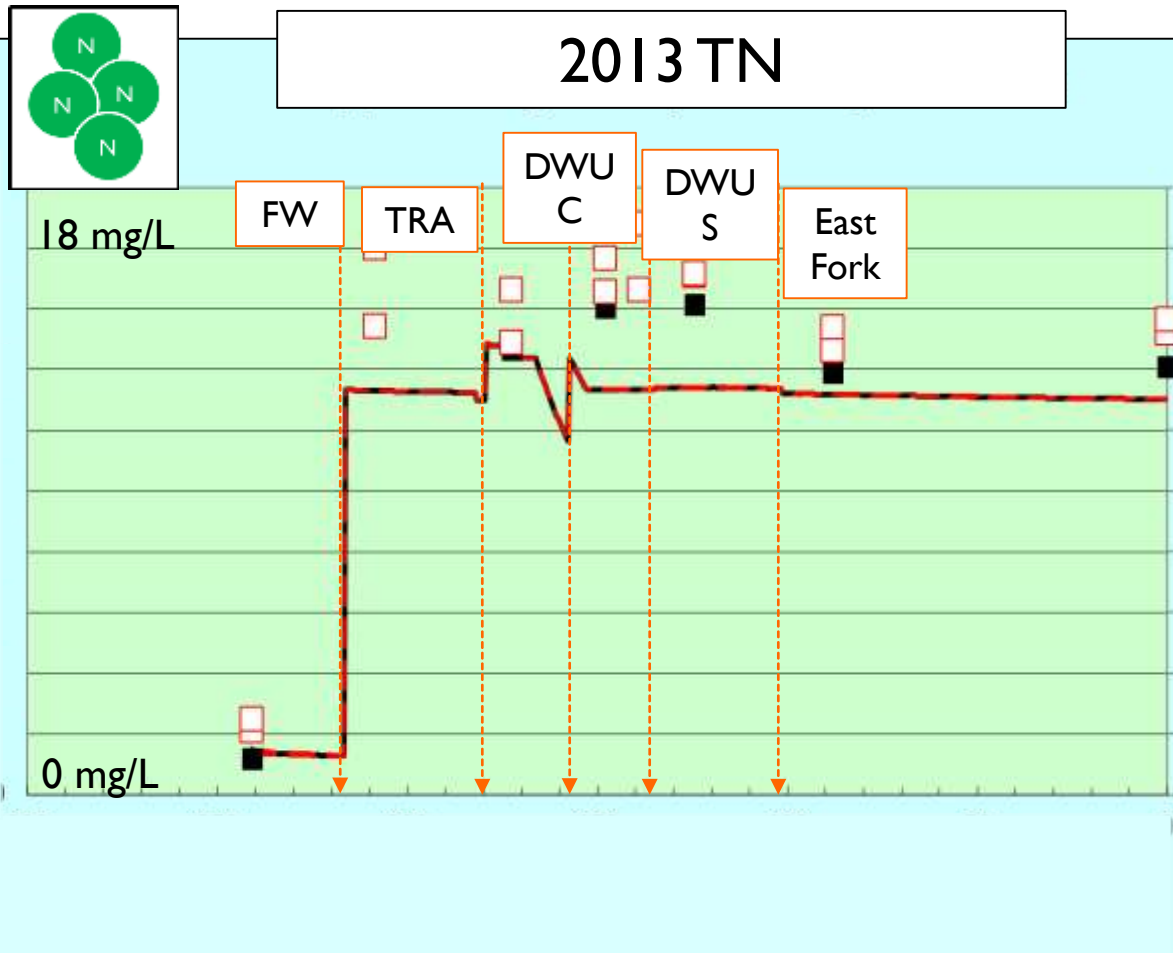


# MONITORING RESULTS FLOW



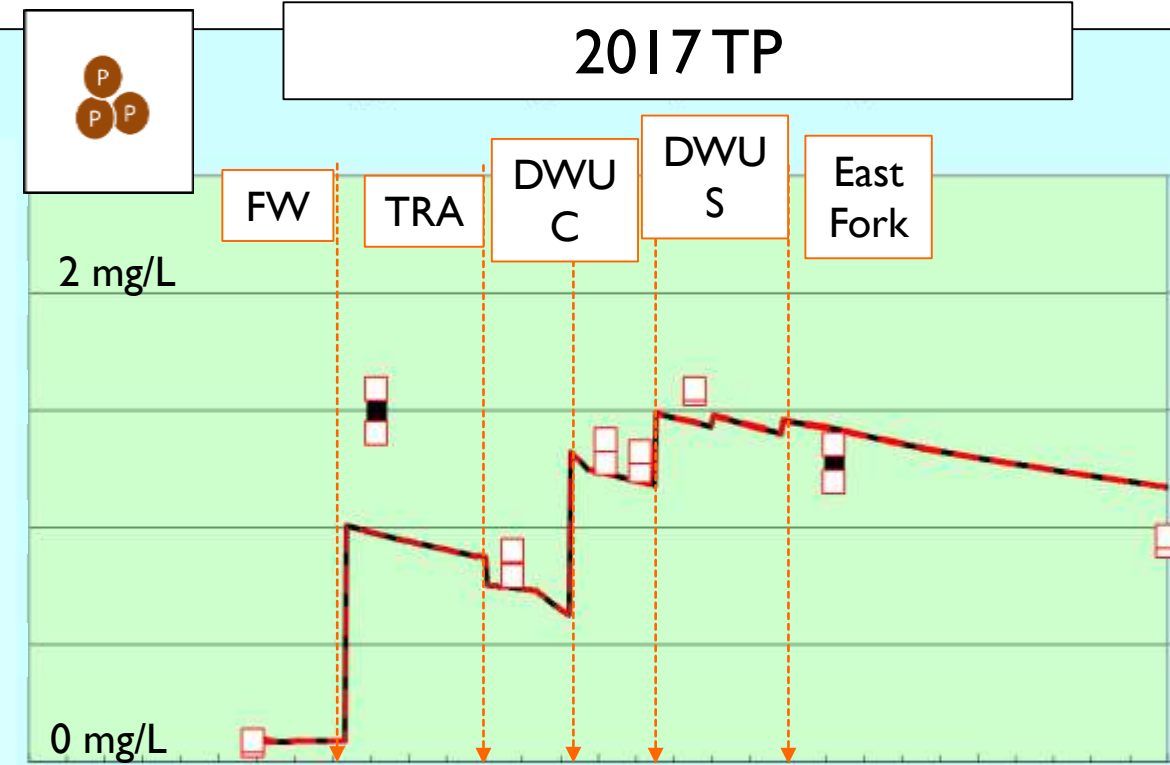
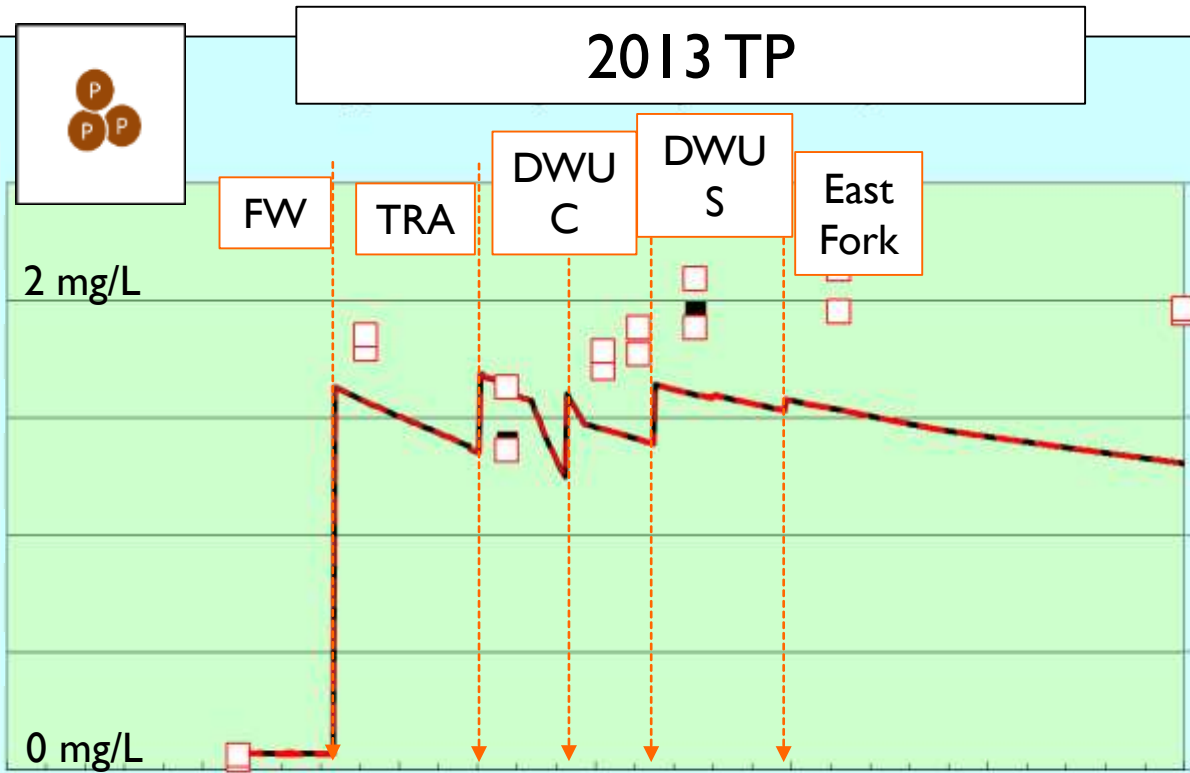
**During the 2013 and 2017 sampling events, Upper Trinity River was an effluent-dominated system.**

# MONITORING RESULTS TOTAL NITROGEN



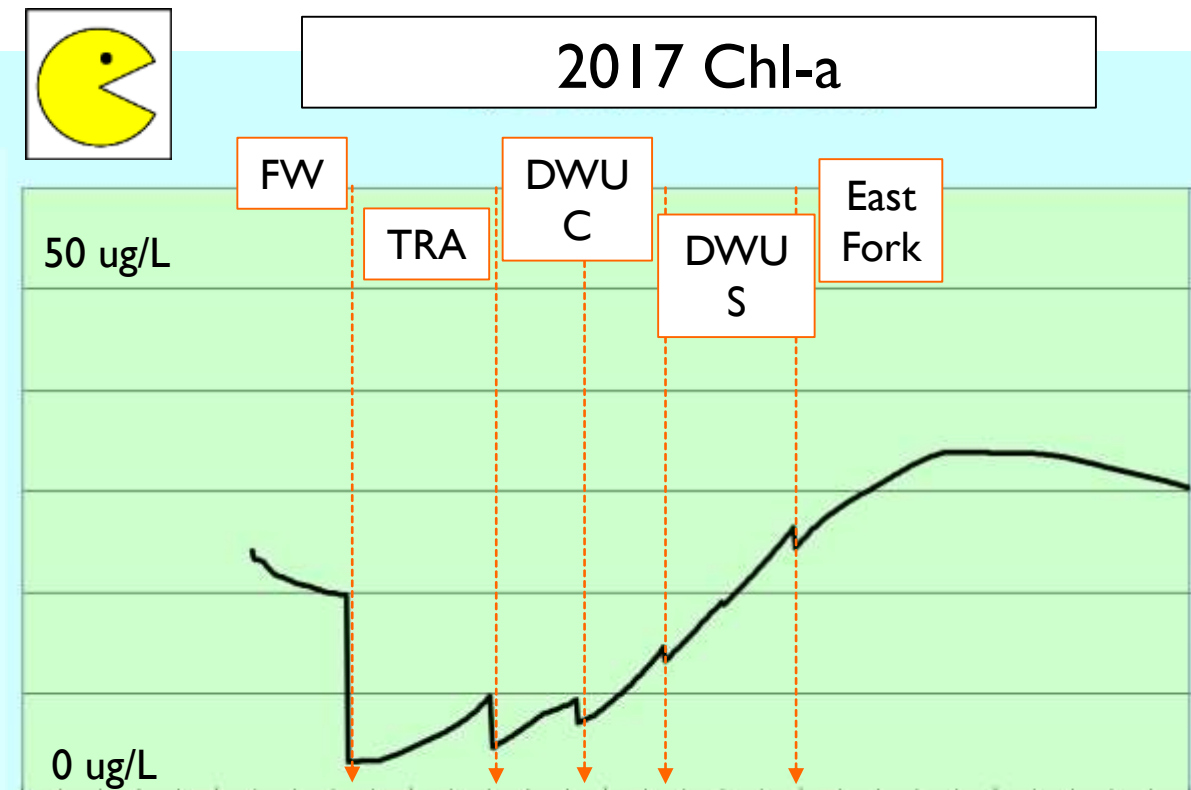
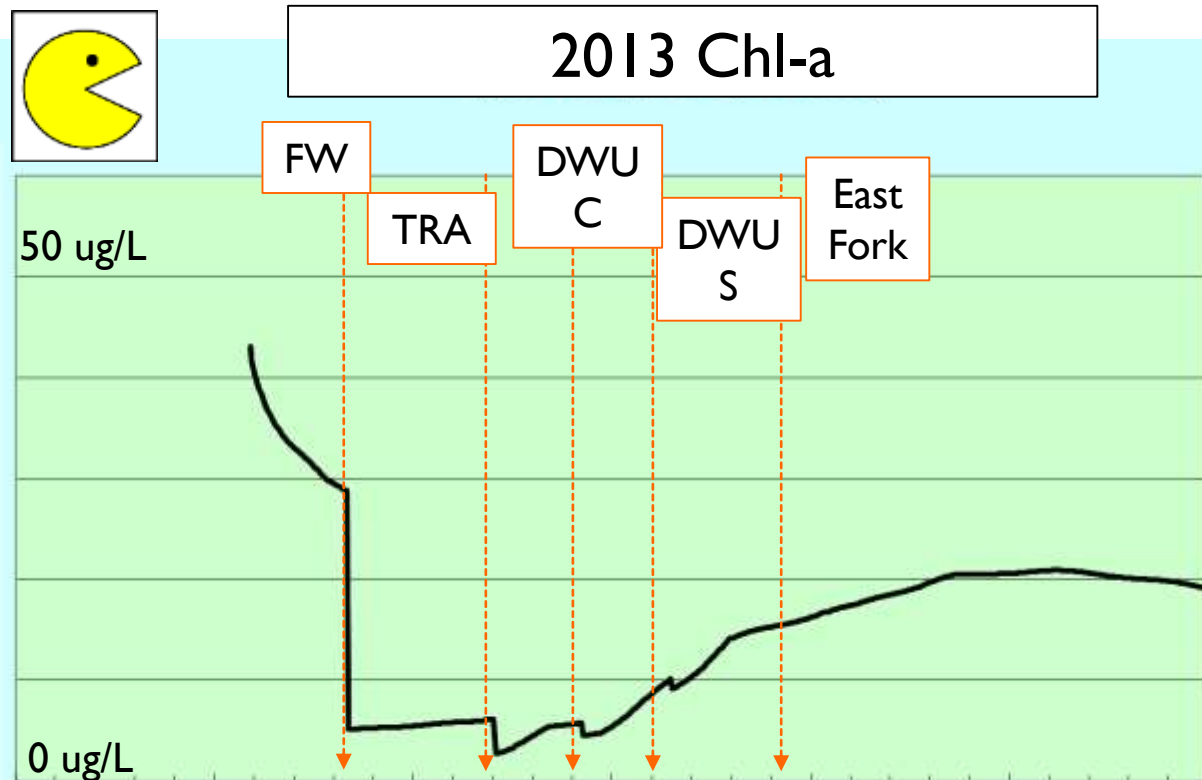
***In 2017, measured TN concentrations were lower than 2013 - possibly because of dilution with baseflow and more algal uptake.***

# MONITORING RESULTS TOTAL PHOSPHORUS



***In 2017, measured TP concentrations were lower than 2013 - possibly because of dilution with baseflow and more algal uptake***

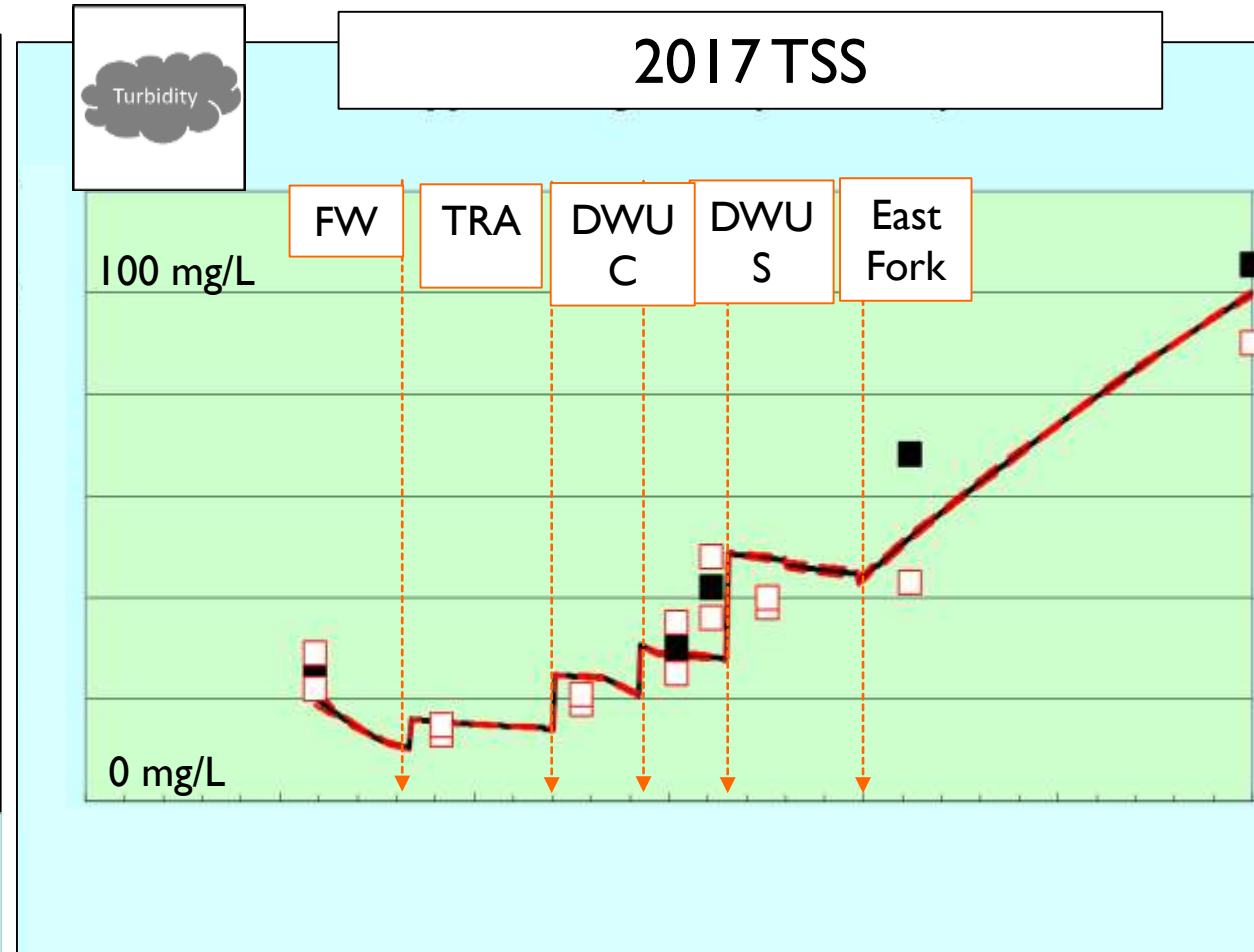
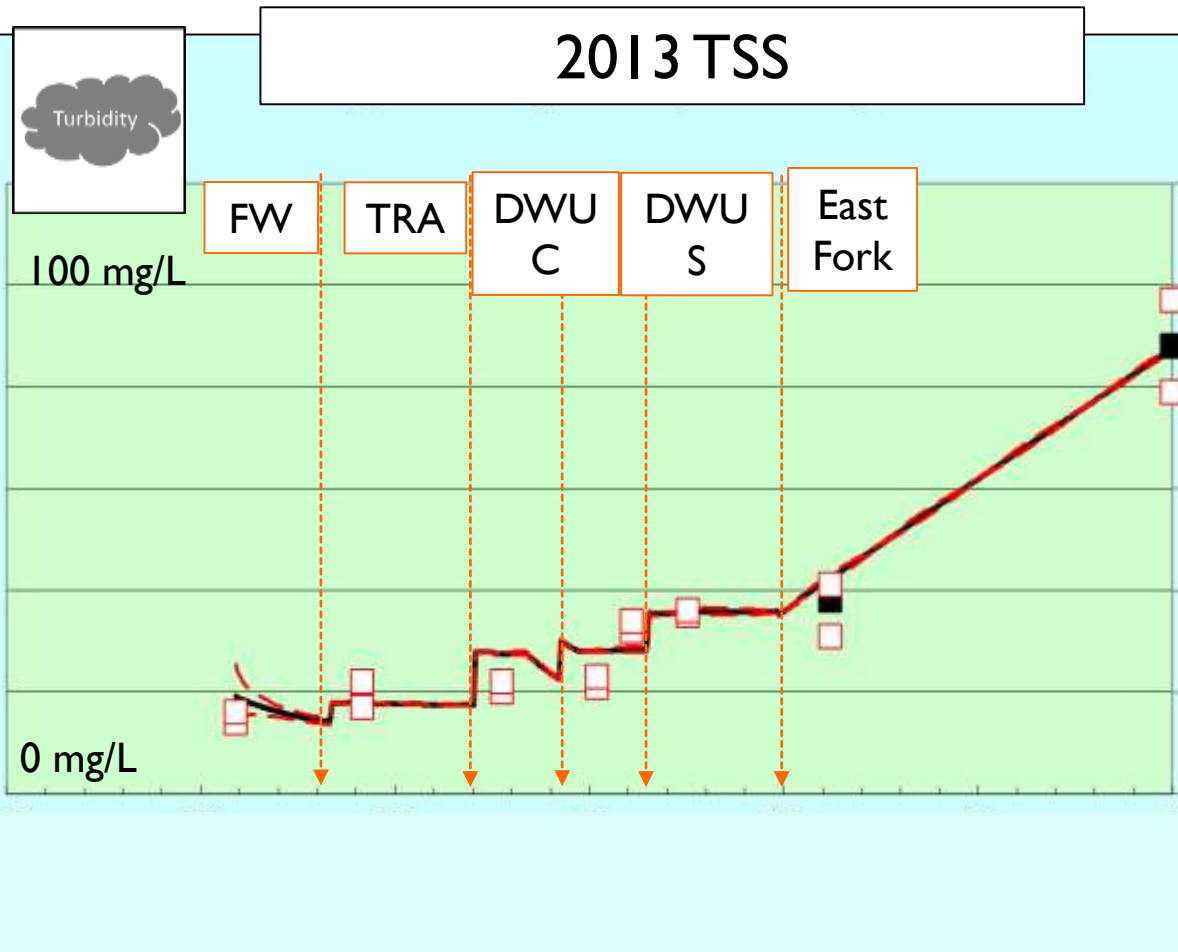
# MONITORING RESULTS CHLOROPHYLL - A



*In both 2013 and 2017, algal growth **slows down and starts to flatten out** after East Fork confluence.*

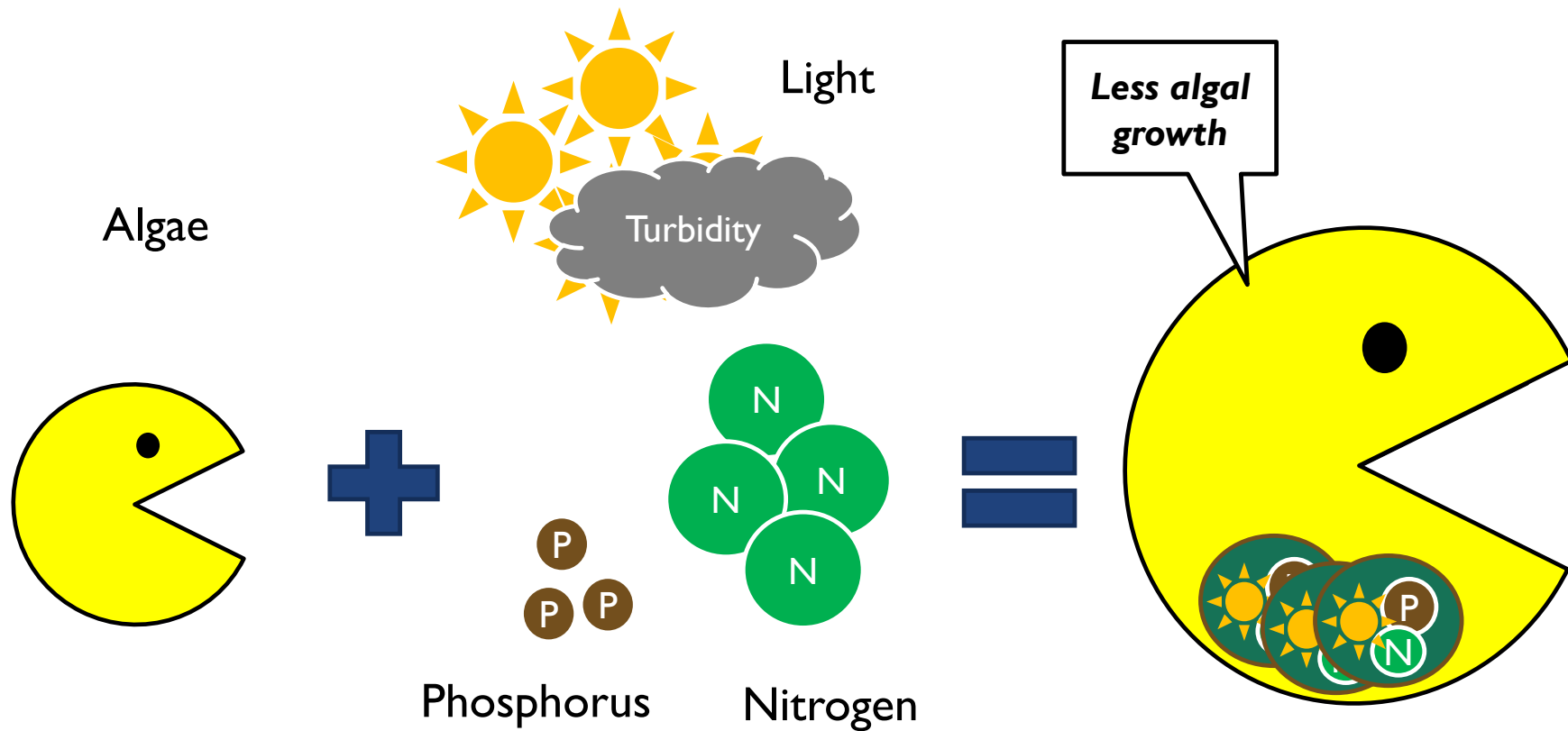
# MONITORING RESULTS

## TOTAL SUSPENDED SOLIDS

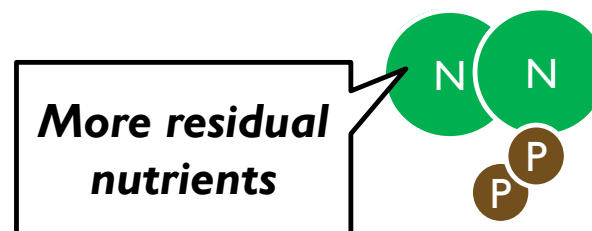


***Upper Trinity becomes more turbid as it flows downstream.***

# MODELING RESULTS



**Model also shows a light-limited system.**



# MODELING RESULTS SENSITIVITY ANALYSIS

- How sensitive are residual nutrient concentrations at Trinidad to WWTP nutrient reductions?
- Approach:
  - Run the following hypothetical scenarios
    - Reduce total WWTP P loads by 50%
    - Reduce total WWTP N loads by 50%
    - Reduce total WWTP N loads by 50% and P loads by 50%
  - Compare residuals at Trinidad with **baseline 2017** scenario



















# MODELING RESULTS

## SENSITIVITY ANALYSIS



### Residual Concentrations at Trinidad, TX

							
		Total Nitrogen (mg/L)	% Change over baseline	Total Phosphorus (mg/L)	% Change over baseline	Chl a (ug/L)	% Change over baseline
Total WWTP Nutrient Load Scenario	Baseline: 2017 conditions	11.3		1.2		30.4	
	 Total P Load	11.3	0.0%	0.6		30.3	
	 Total N Load	5.6		1.2	0.0%	30.3	
	 Total P Load  Total N Load	5.6		0.6		30.3	

# NUTRIENT MODEL CONCLUSIONS

- **Algal growth in the Upper Trinity River is light-limited**
- **High concentrations of inorganic suspended solids create light-limited effect**
- **Significant reductions in WWTP nutrient loads have limited effect on instream algae concentrations**
- **High nutrient residuals remain in river at Trinidad**
- **Effects on downstream reaches, including Lake Livingston, are unknown**

# NEXT STEPS



- **Perform cost-benefit analysis for nutrient reductions**
- **Conduct preliminary assessment of assimilation in reach of Trinity River between Trinidad and Headwaters of Lake Livingston**